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THE GREAT BALL OF FIRE THAT COOLED DOWN AND BECAME THE EARTH

When the earth was being made, it travelled through space like a ball of fire, and red-hot waves rolled over it. Parts of this red-hot stuff were thrown off, and these probably formed the earth.

THE UNITED EDITORS PERPETUAL ENCYCLOPEDIA

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OF THE

ENGLISH LANGUAGE

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GEORGE EDWIN RINES

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THIRTY VOLUMES

ILLUSTRATED

UNITED EDITORS ASSOCIATION

NEW YORK—CHICAGO

MDCCCCXI

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SCHEME OF SOUND SYMBOLS

FOR THE PRONUNCIATION OF WORDS.

Note.—(-) is the mark dividing words respelt phonetically into syllables; (′), the accent indicating on which syllable or syllables the accent or stress of the voice is to be placed.

Sound-symbols employed in Respelling.	Representing the Sounds as exemplified in the Words.	Words respelt with Sound-symbols and Marks for Pronunciation.
ā	mate, fate, fail, aye	*māt, fāt, fāl, ā.*
ă	mat, fat	*măt, făt.*
â	far, calm, father	*fâr, kâm, fâ′ṫher.*
ä	care, fair	*cär, fär.*
aw	fall, laud, law	*fawl, lawd, law.*
ē	mete, meat, feet, free	*mēt, mēt, fēt, frē.*
ĕ	met, bed	*mĕt, bĕd.*
ė	her, stir, heard, cur	*hėr. stėr, hėrd, kėr.*
ī	pine, ply, height	*pīn, plī, hīt.*
ĭ	pin, nymph, ability	*pĭn, nĭmf, ă-bĭl′ĭ-ṫĭ.*
ō	note, toll, soul	*nōt, tōl, sōl.*
ŏ	not, plot	*nŏt, plŏt.*
ô	move, smooth	*môv, smôṫh.*
ö	Goethe (similar to *e* in her)	*gö′ṫeh.*
ow	noun, bough, cow	*nowṅ, bow, kow.*
oy	boy, boil	*boy, boyl.*
ū	pure, dew, few	*pūr, dū, fū.*
ŭ	bud, come, tough	*bŭd, kŭm, tŭf.*
û	full, push, good	*fûl, pûsh, gûd.*
ü	French plume, Scotch guid	*plüm, güd.*
ch	chair, match	*chär, măch.*
ċh	German buch, Heidelberg, Scotch loch (guttural)	*bôċh, hī′dėl-bĕrċh, lŏċh.*
g	game, go, gun	*gām, gō, gŭn.*
j	judge, gem, gin	*jŭj, jĕm, jĭn.*
k	king, cat, cot, cut	*kĭng, kăt, kŏt, kŭt.*
s	sit, scene, cell, city, cypress	*sĭt, sēn, sĕl, sĭt′ĭ, sī′prĕs.*
sh	shun, ambition	*shŭn, ăm-bĭsh′ŭn.*
ṫh	thing, breath	*ṫhĭng, brĕṫh.*
ṫh	though, breathe	*ṫhō, brēṫh.*
z	zeal, maze. muse	*zēl, māz, mūz.*
zh	azure, vision	*ăzh′ėr, vĭzh′ẕn.*

DI SALTO, phrase, *dē sâl'tō* [It.]: in *mus.*, by a leap; used of melody progressing by skips.

DISAMIS, n. *dĭs'-ă-mĭs* [a word without etymological meaning but designed to have its letters symbolic]: in logic, the second mode of the third figure of syllogisms. See SYLLOGISM and MOOD IN LOGIC.

DISANNEX, v. *dĭs'ăn-nĕks'* [L. *dis*, not, and *annex*]: to separate or disunite.

DISAPPEAR, v. *dĭs'ăp-pēr'* [L. *dis*, and *appear*]: to vanish from view; to hide, as from pursuers; to abscond, to cease; to withdraw from sight. DIS'APPEAR'ING, imp. DIS'APPEARED', pp. *-pērd'*. DIS'APPEAR'ANCE, n. *-ăns*, a removal from sight.

DISAPPOINT, v. *dĭs'ăp-poynt'* [L. *dis*, and *appoint*: OF. *desapointer*]: to defeat expectation; to frustrate; to foil; to balk; to hinder from possession or enjoyment of that which was reckoned on. DIS'APPOINT'MENT, n. defeat or failure of expectation.—SYN. of 'disappoint': to baffle; tantalize; fail; defeat; delude; hinder.

DISAPPROBATION: see under DISAPPROVE.

DISAPPROVE, v. *dĭs'ăp-prôv'* [L. *dis*, and *approve*]: to condemn; to censure; to reject; in *OE.*, to dislike. DIS'APPRO'VING, imp. DIS'APPROVED', pp. *-prôvd'*. DIS'APPRO'VAL, n. *-văl*, dislike; disapprobation. DIS'APPRO'VINGLY, ad. *-lĭ*. DISAP'PROBA'TION, n. *-prō-bā'shŭn*, the act of the mind which condemns what is supposed to be wrong; dislike.

DISARM, v. *dĭs-ârm'* [L. *dis*, and *arm:* OF. *desarmer*, to deprive of weapons]: to strip or deprive of arms; to render harmless; to divest of anything threatening. DISARM'ING, imp. DISARMED', pp. *-ârmd'*. DISAR'MAMENT, n. *-âr'mă-mĕnt*, act of depriving of arms, as a conquered army or body of troops—also applied to states; the reduction of the armed force of a state.

DISARRANGE, v. *dĭs'ăr-rānj'* [L. *dis*, and *arrange:* OF. *desarrenger*, to disorder]: to put out of order; to misplace; to unsettle. DIS'ARRANGE'MENT, n. the act of putting out of order; disorder; confusion.

DISARRAY, v. *dĭs'ăr-rā'* [L. *dis*, and *array;* OF. *desarroi*, disorder, confusion]: to undress; to overthrow; to throw into disorder: N. undress; confusion; disorder.

DISASTER, n. *dĭz-ăs'tẽr* [F. *désastre*—from It. *disastro*, an evil chance, something brought about by an evil influence of the stars—from L. *dis*, not; mid. L. *astrōsus*, fortunate—from L. *astrum;* Gr. *astron*, a star—*lit.*, an ill starred or evil chance brought about by the evil influence of the stars]: misfortune; any unfortunate event; calamity; a sudden mishap: V. in *OE.*, to strike with calamity. DIS-AS'TERING, imp. DISASTERED, pp. *dĭs-ăs'tẽrd*, in *OE.*, overwhelmed with calamity. DISAS'TROUS, a. *-trŭs*, occasioning loss or injury; unfortunate; unlucky; calamitous. DISAS'TROUSLY, ad. *-lĭ*. DISAS'TROUSNESS.—SYN. of 'dis-

aster': visitation; mishap; mischance; misadventure; grief; unhappiness.

DISAVOW, v. *dĭs'ă-vow'* [L. *dis,* not, and *avow:* OF. *desavouer,* to disavow]: to deny; to disown; to reject; the opposite of *own* or *acknowledge.* DIS'AVOW'ING, imp. DIS'AVOWED', pp. *-vowd'.* DIS'AVOW'AL, n. *-ăl,* DIS'AVOW'MENT, a disowning; a denial.—SYN. of 'disavow': to repudiate; disclaim; disallow; disprove.

DISBAND, v. *dĭs-bănd'* [L. *dis,* apart, and *band:* OF. *desbander,* to loosen, to unbind]: to dismiss, as a regiment or corps from military service; to scatter or disperse. DISBAND'ING, imp. DISBAND'ED, pp. DISBAND'MENT, n. the act of breaking up or dismissing, as from military service. —The greatest disbanding in history was that of the volunteer army of the U. S. which had put down the rebellion: abt. 1,100,000 men laid down their arms 1865 and quietly merged themselves in the general citizenship.

DISBAR, v. *dĭs-bâr'* [L. *dis,* separation or parting from, and Eng. *bar*]: to deprive a barrister of his right to plead. DISBAR'RING, imp. DISBARRED', pp. *-bârd'.* DISBAR'RING, n. the expelling of a barrister or lawyer from the bar, a power vested in *England* in the benchers of the four Inns of Court, subject to an appeal to the 15 judges:—in *Scotland,* in the Faculty of Advocates (q.v.):—in the *United States,* vested in the judges of the court having authority to admit to legal practice. There is no appeal; but a restoration is sometimes possible after probation.

DISBELIEVE, v. *dĭs'bĕ-lēv'* [L. *dis,* and *believe*]: not to believe; to refuse to credit. DIS'BELIEF', n. *-lēf',* denial of belief; distrust; skepticism; incredulity; infidelity; in *philosophy.* See BELIEF.

DISBUD, v. *dĭs-bŭd'* [L. *dis,* asunder, and *bud*]: to deprive of buds or shoots.

DISBURDEN, v. *dĭs-bĕr'dn,* sometimes DISBUR'THEN [L. *dis,* asunder, and *burden*]: to throw off a burden; to unload; to clear of anything weighty or troublesome; to ease the mind. DISBURD'ENING, imp. *-berd'nĭng.* DISBUR'DENED, pp. *-bĕr'dnd,* relieved; eased of a burden.—SYN. of 'disburden': to unload; discharge; disencumber; relieve; free; unburden; confess.

DISBURSE, v. *dĭs-bĕrs'* [F. *débourser;* OF. *desbourser,* to disburse—from L. *dis,* asunder; L. *bursa;* F. *bourse,* a purse]: to pay out money, as from a public fund or treasury; to spend or lay out money. DISBUR'SING, imp. DISBURSED', pp. *-bĕrst'.* DISBURSE'MENT, n. *-bĕrs'mĕnt* [F. *déboursement*]: the act of paying out money; the money paid out—used generally in *plu.,* DISBURSE'MENTS.

DISBURTHEN, v. *dĭs-bĕr'thn:* the more correct spelling of DISBURDEN, which see.

DISC, and DISCOBOLUS: see QUOIT.

DISCANDY, v. *dĭs-kăn'dĭ:* an OE. word not well understood, occurring twice in Shakespeare's 'Antony and Cleopatra,' and usually said to signify 'to melt, to dissolve,' as

from *dis*, asunder, and *candy*, the sweet-meat; these meanings do not make the sense plain in Shakespeare. DISCAN'DYING, imp. DISCAN'DIED, pp. *-kăn'dĭd*. *Note.*—Dr. C. Mackay derives the word from Gael. *diosgan*, to dry up.

DISCARD, v. *dĭs-kârd'* [Sp. *descartar*, to throw cards out of one's hands: L. *dis*, asunder, and Eng. *card—lit.*, to throw out of one's hands the useless cards]: to dismiss from service, employment, or society; to cast off; to reject. DISCAR'DING, imp. DISCAR'DED, pp.—SYN. of 'discard': to dismiss; discharge; displace; cashier; pay off; cast off; turn away; put away.

DISCARIA, n. *dĭs-kär'ĭ-a* [L. *discus;* Gr. *diskos*, a quoit, a disk, so called from the breadth of the disk]: genus of plants, order *Rhamnaceæ*. *D. febrifuga* yields the quina of Brazil: see CINCHONA.

DISCELIACEÆ, n. plu. *dĭs-sĕl-ĭ-ā'sē-ē* [Gr. *dis*, twofold; *skelos*, a leg, a limb]: family of operculate acrocarpous mosses, of gregarious habits, dwarf and stemless, arising from a green prothallium spreading on the ground, DISCEL'IUM, n. *-ĭ-ŭm*, genus of mosses, type of the family *Discceliaceæ*.

DISCERN, v. *dĭs-zĕrn'* [F. *discerner*—from L. *discernĕrĕ*, to set apart—from *dis*, asunder; *cerno*, I see, judge, or separate]: to see exactly; to separate by the eye or the understanding; to judge; to distinguish; to discriminate. DISCERN'ING, imp.: ADJ. acute; judicious; sharp-sighted. DISCERNED' pp. *-zĕrnd'*. DISCER'NER, n. *-nĕr*, one who. DISCERN'MENT, n. [F. *discernement*]: the power of distinguishing one thing from another, as truth from falsehood; power of perceiving differences in things or ideas. DISCERN'IBLE, a. *-ĭ-bl*, visible; perceptible; manifest; that may be seen. DISCERN'IBLY, ad. *-blĭ*. DISCERN'IBLENESS, n. *-bl-nĕs*. DISCERN'INGLY, ad. *-lĭ*.—SYN. of 'discern': to discover; detect; descry; espy; perceive; penetrate; behold; note; recognize; apprehend;—of 'discernible': distinguishable; apparent; evident; discoverable;—of 'discernment': penetration; discrimination; judgment; discretion; acuteness; sagacity; insight.

DISCHARGE, v. *dĭs-chârj'* [L. *dis*, and Eng. *charge:* F. *décharger;* OF. *descharger*, to unload]: to unload, as a ship; to free from any obligation or penalty by written evidence, etc.; to pay, as a debt; to throw off or out; to let fly; to explode, as powder; to fire or let off, as a gun; to absolve or acquit; to free from claim or demand of money by a written acknowledgment of payment; to perform trust or duty; to deprive of office; to dismiss; to emit or send out; to set at liberty: N. a flowing or issuing out; that which is thrown out; dismission from office or employment; the written evidence of release from debt or obligation; liberation, as from imprisonment DISCHARG'ING, imp. DISCHARGED', pp. *-chârjd'*. DISCHARG'ER, n. one who or that which.—SYN. of 'discharge, v.': to unload; disburden; clear; exonerate; shoot; perform; execute; fulfil; emit; send out; release; set free; throw off; discard.

DISCHARGE′, from the Military Service: by right at the expiration of the period for which attested; or earlier, by indulgence. In the latter case, the grant may be on reduction of numbers, or when the man is not worth retaining.

Soldiers are occasionally 'discharged with ignominy,' for some offense that brings dishonor on the corps. In such case, the regiment is assembled, the crime recapitulated, and the sentence read. The buttons, facings, chevrons medals, and all decorations, are cut from the man's uniform, and he is 'drummed out' of the regiment, if a foot-soldier, or by sound of trumpet, if it be a cavalry regiment.

DISCHARGE, Electric. (1) The phenomenon of loss of stored electricity in condensers which passes to some outside circuit. (2) The act of giving out electric current as from electric batteries. See Batteries, Storage, and Condenser.

DISCHARG′ING, in the Navy: the process of placing a ship 'out of commission.' A regiment of soldiers is permanently in pay, whether engaged in active service or not; but the crew of a ship are paid wages only so long as their names are on the books of a ship 'in commission.' Naval officers, too, are on full pay only so long as they belong to a particular ship in commission, except when ordered to certain duties on shore.

DISCHIDIA, n. *dĭs-kĭd′ĭ-a* [Gr. *dis*, twice, twofold; *schidion*, a splinter]: pitcher-plants (not to be confounded with *Nepenthes distillatoria*, *Sarracenia purpurea*, and others, belonging to widely different orders of plants): genus of plants belonging to the order *Asclepiadaceæ*. They are shrubs or herbs, natives of India and Australia. *Dischidia Rafflesiana*, a creeping plant with a long twining stem, is destitute of leaves until near the summit, and as this may be two ft. or more from the roots, it can hardly depend on them for nourishment by absorption of fluid from the ground. It is therefore provided with a means for storing up the moisture which it from time to time collects. The pitcher appears formed of a leaf, with the edges rolled toward each other and adherent; the upper end, or mouth, is open to receive whatever moisture may descend from the air. The plant has also a tuft of absorbent fibres resembling those of the roots, which are prolonged from the nearest part of the branch, or even from the stalk to which the pitcher is attached, and spread through the cavity. They introduce into the plant the nourishment collected in the pitchers.

DISCIDE, v. *dĭs-sīd′* [L. *dis*, twice; *cædo*, I cut, I kill]: in *OE.*, to cut in two; to divide. Disci′ding, imp. Disci′ded, pp.

DISCIFORM, etc.: see under Disk.

DISCINA, n. *dĭs′sĭ-na* [L. *discus*, a quoit]: genus of fossil brachiopods, in which the shell is generally circular or orbicular; the upper valve is limpet shaped, and the ventral valve flat or partly convex.

DISCIPLE, n. *dĭs-sī′pl* [F. *disciple*—from L. *discĭpŭlus*, a learner—from *disco*, I learn]: one who receives instruction from another; a pupil; a follower; an adherent in doctrine, etc.: V. to train; to rear; to bring up. DISCI′PLING, imp. *-sī′plĭng*. DISCI′PLED, pp. *-sī′pld*. DISCI′PLESHIP, n. the state of a disciple. DISCIPLINARIAN, n. *dĭs′sĭ-plĭn-ā′rĭ-ăn* [L. *discĭplīna*, instruction, teaching]: one who conducts a school with strictness and precision; one who instructs in naval and military tactics; one who allows no deviation from stated rules. DIS′CIPLINARY, a. *-plĭn-ĕr-ĭ*, pertaining to discipline. DIS′CIPLINE, n. *-plĭn* [F.—L.]: training, physical or mental; cultivation and improvement; subordination or subjection to laws, etc.; bodily punishment; chastisement: V. to train and educate the body; to form the mind in habits of thought and action; to chastise; to punish. DIS′CIPLINING, imp. DIS′CIPLINED, pp. *-plĭnd*. DIS′CIPLINABLE, a. *-ă-bl*, that may be subjected to discipline; capable of instruction. DIS′CIPLIN′ABLENESS, n. *-bl-nĕs*. DIS′CIPLINANT, n. *-ănt*, one of a religious order, so called from exercising a strict discipline, or from scourging themselves.—SYN. of 'disciple, n.': learner; adherent; pupil; supporter; partisan;—of 'discipline, n.': training; education; instruction; culture; punishment; correction; drill; subjection; submissiveness;—of 'discipline, v.': to train; regulate; correct; form; bring up; chasten.

DISCIPLES OF CHRIST, OR CHRISTIANS, (at first called REFORMERS, CHRISTIAN BAPTISTS and nicknamed CAMPBELLITES) a large and growing body of Christians which had its origin in the initiative and labors of Thomas Campbell, a 'Seceder' Presbyterian minister from Ireland, who settled in Western Pennsylvania in the year 1807, and of his son Alexander, who followed him two years later. Disapproving as they both did sectarian divisions and strife in the church and their perpetuation in denominational organizations, they earnestly desired, and sought to achieve the union of Christians on the basis of apostolic Christianity. Gathering a few friends into a Society known as the Christian Association of Washington, for the promotion of pure evangelical Christianity and the unification of the churches, they determined to reject the authority of all creeds and doctrinal standards of human origin, and to adhere to the Scriptures as their only rule of faith and practice. On this basis a small congregation was organized at Brush Run out of the Christian Association of Washington County, Pa. Of the church Thomas Campbell was an elder, and by it Alexander was ordained. Having become convinced by a long and careful study of the Greek New Testament that there was no scriptural authority for infant baptism, and that immersion only was baptism according to that book, they, with their wives and three other persons, were immersed by a Baptist minister, 1812, June 2. After this, their plea for the unity of Christendom on a New Testament basis, took definite shape and became a conspicuous part of their preaching.

Their numbers having increased, so that five or six congregations were formed, they were, in 1813, received into

the Red Stone Bapt. Association. Leaving that body 10 years later they united with the Mahoney Assoc. in Ohio. About 1827 the Baptist churches generally withdrew fellowship from the Disciples, and they consequently formed organizations of their own. At a very early period Alexander Campbell took the place of his father as the leader of the new movement. In preaching he was very active, extending his labors far from his own home. In 1823 he established *The Christian Baptist* which was printed, at first, on his own press, and (its name having been, in 1830, changed to *The Millennial Harbinger*) was continued until his death in 1866. In it he advocated his views with great persistence and force. In 1835 he greatly enlarged his work and influence by founding Bethany College in West Virginia, of which he continued pres. until his death. But his influence was, perhaps, most powerful in public debate, in which he ably contended with various prominent adversaries: in 1823, *on baptism* with Rev. Wm. L. McCalla, a Presbyterian minister famous for the vigor and skill with which he attacked everything that he deemed erroneous, in the church or out of it; in 1828, *on the truth of Christianity*, with Robert Owen; in 1836, *on papal infallibility* with Archbishop Purcell; and in 1843; *on the distinctive views of the Disciples* with Rev. Dr. N. L. Rice.

The form of government among the Disciples is congregational. No division of the church into 'clergy and laity' is recognized; but there are three classes of administrative officers with scriptural names: 1. Elders, Presbyters, or Bishops; 2. Deacons; 3. Evangelists, who are missionaries, supported by voluntary contributions. There are state and national organizations for co-operative work in spreading the Gospel at home and abroad; but having no legislative or judicial functions in matters of faith and practice. The denomination has sometimes been charged with teaching baptismal regeneration. This they deny, affirming on the contrary that they assign no efficacy or value to baptism except as an appointed declaration of faith in Christ. They regard it as the soldier's oath or '*Sacramentum*,' by which he swears allegiance to Jesus as king and is enrolled in the army of the Lord. They place it immediately after faith and a renewed heart; and regard it as a pledge of divine forgiveness and acceptance. They raise no question about 'open.' or 'close' communion. Believing that the Lord's Supper is for the Lord's people and that He has issued His own invitation, they spread the table and repeat His invitation; but institute no inquisition to discover whether any of the proposed communicants are without immersion. Their opinion, however, has been understood to be that only the immersed are really baptized, and that only the baptized are invited by Christ to His table. They administer the Lord's Supper every Lord's day, following, they say, the custom of the Apostolic Church. Regarding it not as a sacrifice, but as a simple, tender feast in memory of our Lord, in which his disciples may

joyfully participate, they find it an unfailing source of religious inspiration, and a powerful motive for securing regularity in church attendance. The Lord's day they regard not as the Sabbath, but as a New Testament appointment in memory of the resurrection.

In common with all evangelical Christians the Disciples of Christ hold these great fundamental truths of the Gospel: 1. The divine inspiration of the Holy Scriptures, constituting them the all-sufficient and only sufficient revelation of God's will and rule of faith and practice; the Old Testament equally inspired with the New, but not equally binding upon Christians; the Old being especially God's will for the Jewish Church, the New, for men now, to whom He speaks by His Son. The Christian institution begins not with Abraham, or Moses, or John the Baptist, but at Pentecost; and the New Testament contains the history, constitution, and laws of the Church of Christ. 2. The manifestation of God in the tri-personality of Father, Son, and Holy Ghost; the proper deity of Jesus as the Christ the Son of God; His incarnation, teaching, miracles, death as a vicarious sacrifice for sin; His resurrection, ascension, and exaltation to supreme authority at the right hand of God; the personality of the Holy Spirit; His mission to convict the world of sin, and to comfort and sanctify Christians. 3. The moral depravity of the human race, their alienation from God, and consequent dependence on His mercy in Christ; their need of the new birth, leading to faith and repentance; justification by faith without works of the law, followed by personal holiness in all true Christians. 4. The Church of Christ as a divine institution, composed of all who by faith and obedience confess His name. 5. The fulness and freeness of the Gospel to all who will embrace it on the conditions proposed in the New Testament; so that if, under faithful Scriptural preaching, any persons remain unsaved, it is because they have not responded to God's call. 6. The final, general judgment and separation of the righteous from the wicked—the former entering into everlasting life, and the latter into everlasting punishment.

While the Disciples of Christ have churches in almost all the states, about one-half of the membership is concentrated in the adjoining states of Mo., Ind., Ky., Ill., and O., forming, perhaps, the most solid church population within this territory of any protestant denomination with the one exception of the Meth. Episc. There are also churches in Canada, Great Britain, Sweden, and Australia. In the latter country the denomination is growing rapidly.

Missions.—The work of home is prosecuted by state agencies, where these are sufficiently strong, supplemented by the National Missionary Convention in weaker localities and on the frontier. Foreign Missions are being successfuly conducted in China, India, Japan, Africa, Jamaica and other foreign countries. The Disciples have a Church Extension Society, a Ministerial Aid Society and a National Benevolent Association, all of which are raising and expending large sums of money in their respective fields.

This church presents an instance of most rapid growths during the past 25 years. From 1880 to 1890 it made a gain of 83 per cent. in membership, and of 47 per cent. in the next five years. The statistics for 1906 are as follows: Churches, 11,787; ministers, 7,951; communicants, 1,318,215; Sunday schools, 9,465; scholars and teachers, 915,275; value of church property, $24,751,649; Missions, home and foreign, $837,627,89; church expenses, $4,000,000.

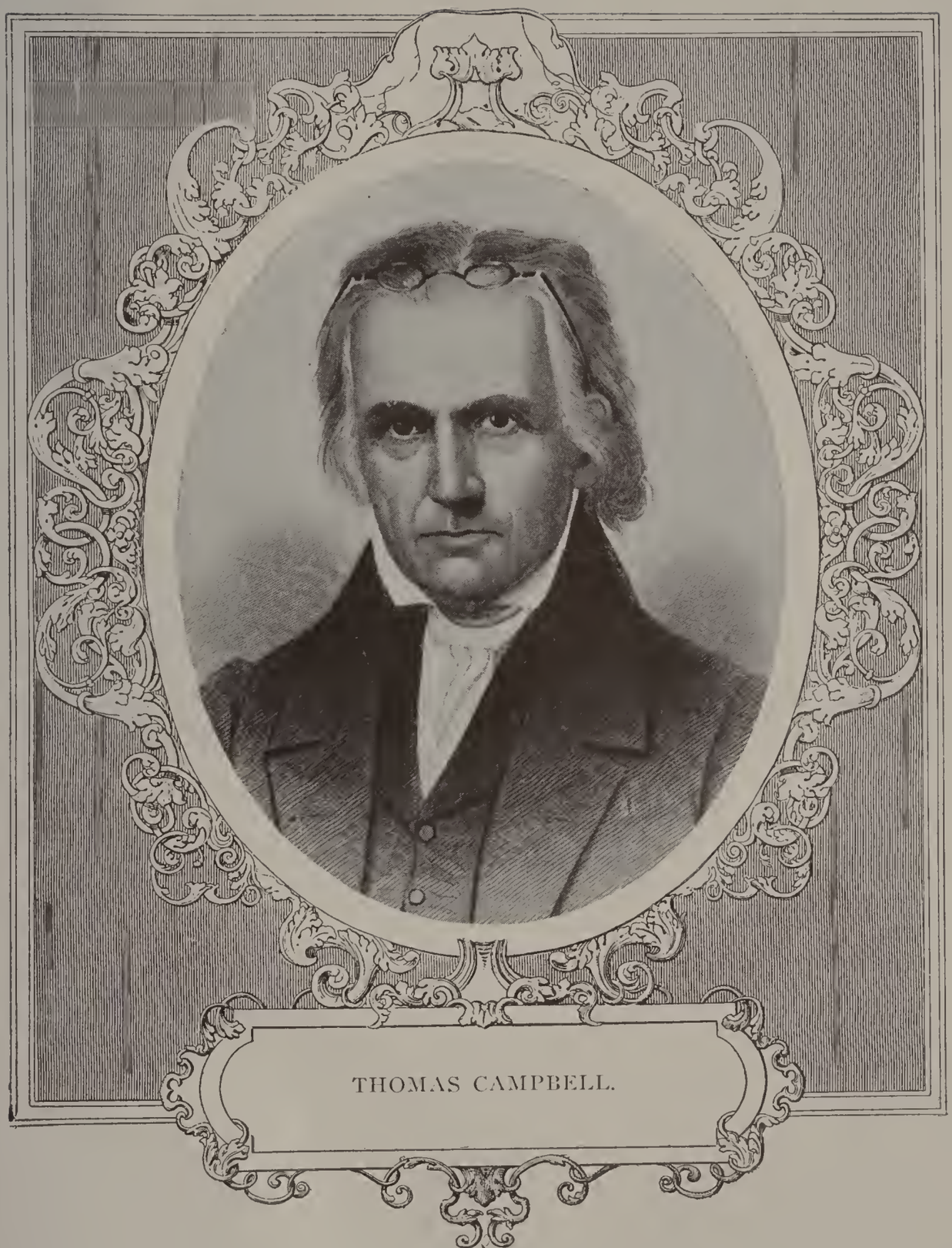
The church has 6 universities and 36 colleges including Bible Chairs in State universities, with a total of 600 teachers and over 10,000 students. More than a thousand of the latter are studying for the ministry. The leading institutions are Kentucky University, at Lexington, Ky.; Drake University, Des Moines, Ia.; Butler College of the University of Indianapolis, Ind.; Bethany College, Bethany, W. Va.; Hiram College, Hiram, O.; and Eureka College, Eureka, Ill.

The denominational Publishing Houses have been established in Cincinnati, St. Louis and Chicago, for the supply of Sunday school, biblical and other literature. The three principal weeklies published by these houses are the *Christian Standard*, Cincinnati, *Christian Evangelist*, St. Louis, and the *Christian Century*, Chicago.

DISCIPLINE, in Naval and Military matters: general term sometimes used as meaning 'system of instruction,' but its signification is really much broader. Its technical sense includes not only the means provided for exercise and instruction, but subjection to all laws framed for the govt. and regulation of the army and navy. Discipline should rest entirely on law, should have its roots in patriotism, and be adapted to the character of the people and the nature of the govt. The Articles for the government of the Navy, Articles of War, Regulations, and Orders from the naval and military authorities form collectively the code by which discipline is regulated. In the army, captains are responsible for the discipline of their companies; post-commanders for the discipline of their posts, etc. See ARTICLES OF WAR: MUTINY ACT: CAPTAIN; ETC.

DISCIPLINE, ECCLESIASTICAL, the control and correction which ecclesiastical bodies claim the right to exercise and administer for the purpose of maintaining correctness of living, and soundness of belief among their members. The only form of discipline at present exercised over contumacious lay members of a religious body consists of excommunication, or exclusion from a share in the ministrations and offices of the Church. The clergy, on the other hand, are liable to suspension or deposition; the former a temporary, the latter a perpetual deprivation of office and authority. See INQUISITION.

DIS'CIPLINE, FIRST BOOK OF (or FIRST BOOK OF POLICY), in Scottish Ecclesiastical History: important document, drawn up by John Knox and four other Presb. ministers, 1560. With the Confession of Faith of the same year, it must be held as exhibiting the principles on which



THOMAS CAMPBELL.

the Reformed Church of Scotland was originally founded. It lays down rules for the election of 'pastors or ministers' by the congregation, their examination by 'the ministers and elders,' etc., also for the election of elders and of deacons; it recognizes the office of superintendent (q.v.) as then established; but it is most largely occupied with things pertaining to ecclesiastical discipline, strictly so called, and the mode of dealing with persons guilty of offenses. The First Book of Discipline never received the sanction of an act of parliament, but was subscribed by many of the nobles and barons.

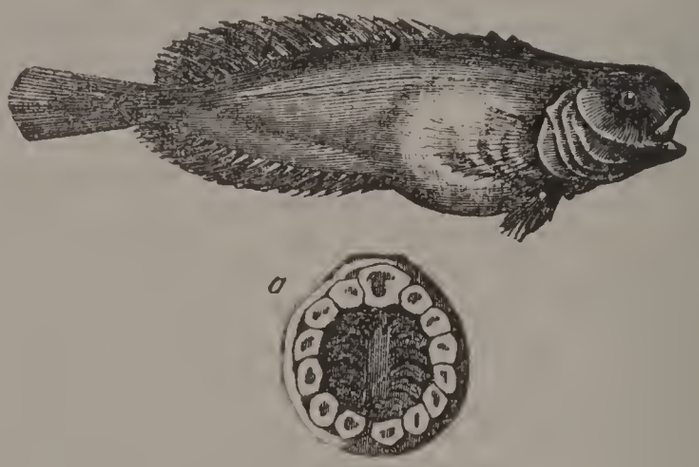
DISCIPLINE, SECOND BOOK OF, or 'Heads and Conclusions of the Policy of the Kirk:' document of great importance in the ecclesiastical history of Scotland, adopted by the general assembly 1578; and, though never ratified by act of parliament, still frequently appealed to as the most perfect and authoritative exhibition of Scotish Presbyterianism. The separations which have taken place from the Established Church in Scotland, have been on the professed ground not of dislike to the constitution exhibited in the Second Book of Discipline, but of anxiety for its perfect maintenance; and this document has recently been adopted as one of the articles of union among Scottish Presb. churches in Australia. It was prepared with great care by a committee of the general assembly, in which Andrew Melville had a leading part; and in a time of much conflict between the court and the church, concerning the power of the civil government in things ecclesiastical, church government, and patronage (q.v.). It begins by asserting strongly the powers regarded as essentially inherent in the church, sets forth the distinctions between civil and ecclesiastical government and their mutual relations, and lays down a thoroughly Presb. platform of church government.

DISCLAIM, v. *dĭs-klām'* [L. *dis*, not, and *claim*]: not to claim; to disown; to reject as not belonging to one's self; to deny the possession or knowledge of; to renounce a claim to. DISCLAIM'ING, imp. DISCLAIMED', pp. *-klāmd'*. DISCLAIM'ANT, n. *-klām'ănt*, one who disclaims. DISCLAIM'ER, n. a denial; a disavowal.—SYN. of 'disclaim': to disavow; deny; renounce; reject; relinquish; decline.

DISCLOSE, v. *dĭs-klōz'* [L. *dis*, asunder, and *close*]: to open; to uncover; to reveal; to bring to light; to tell; to utter; to make known. DISCLO'SING, imp. DISCLOSED', pp. *-klōzd'*. DISCLO'SER, n. *-zẽr*, one who. DISCLO'SURE, n. *-klō'zhûr*, an uncovering; an opening to view: the act of making known that which was hidden; that which is made known.—SYN. of 'disclose': to divulge; discover; tell; unveil; unclose; set free; lay open; expose.

DISCOBOLI, *dĭs-kŏb'o-lī:* according to Cuvier, a family of malacopterous fishes, remarkable for having the ventral fins united to form a sucking disk on the under surface of the body. To this family, also called *Cyclopteridæ*, belong the Lump sucker (*Cyclopterus lumpus*), the unctuous sucker or sea-owl or cock-paddle *snail*, and one or two

other British fishes. To this family Cuvier referred also the Remora (q.v.), adverting, however, to the diffesent position of the sucking disk, and other important distinctions, on account of which a very different place in the system is now assigned to it. The use of the sucking disk, however, is much the same—that of attaching the animal to fixed sub-



Discoboli (*Liparis Montagui*):
a, sucker, on a larger scale.

stances, so that it may remain and obtain its food, where otherwise it would be swept away by the current. The adhesive power of the sucker, in the larger specimens of the lumpfish, remains after death.

DISCOCEPHALUS, n. *dĭs-kō-sĕf'a-lŭs* [Gr. *diskos*, a disk; *kephalē*, a head]: genus of *Infusoria*, belonging to the family *Euplota*. One species, *D. rotatorius*, is a native of the Red Sea.

DISCOID, a. *dis'koyd*, or DISCOI'DAL, a. *-koy'dăl* [Gr. *diskos*, a round plate; *eidos*, resemblance (see DISK)]: having the form of a disk or round plate.

DISCOLOR, v. *dĭs kŭl'ĕr* [L. *dis*, the opposite of, and *color:* OF. *descolorer* and *descoulourer*, to discolor]: to stain; to tinge; to alter the natural hue or color of; to alter the complexion. DIS'COLORA'TION, n. *-ā'shŭn*, the act of altering the color; a staining; alteration of color.

DISCOMFIT, v. *dĭs-kŭm'fĭt* [OF. *desconfit*, or *déconfit*, overthrown, defeated—from mid. L. *disconfectus*, overthrown, destroyed—from L. *dis*, completely; *conficio*, I defeat]: to defeat; to scatter in battle; to vanquish; to disappoint; to frustrate. N. overthrow; defeat. DISCOM'FITING, imp. DISCOMFITED, pp. DISCOMFITURE, n. *dĭs-kŏm'fĭt ūr* [F. *déconfiture*]: defeat in battle; overthrow; disappointment.

DISCOMFORT, v. *dĭs-kŭm'fĕrt* [L. *dis*, the opposite of, and *comfort:* OF. *desconfiter*, to be discomfited]. uneasiness, mental or physical; pain; grief. V. to make uneasy; to pain or grieve.

DISCOMMODE, v. *dĭs'kŏm-mōd'* [L. *dis*, and Eng. *ac-*

commodate: F. *commode*, commodious, convenient]: to put to inconvenience; to trouble; to molest.

DISCOMPOSE, v. *dĭs'kŏm-pōz'* [L. *dis*, the opposite of, and *compose*]: to disorder; to unsettle; to confuse, to agitate or ruffle, as the mind. DIS'COMPO'SING, imp. DIS'COMPOSED', pp. *-pōzd'*. DIS'COMPO'SURE, n. *-pō'zhûr*, disorder, agitation.—SYN. of 'discompose': to disconcert; confound; frustrate; foil; derange; ruffle; battle; disturb; defeat; abash.

DISCONCERT, v. *dĭs'kŏn-sĕrt'* [L. *dis*, apart, and *concert;* L. *concertārĕ*, to strive together: OF. *disconcerter*, to disorder—*lit.*, to strive together contrary ways]: to defeat or interrupt any order, plan, or scheme; to discompose or unsettle the mind; to defeat; to frustrate; to confuse. DIS'CONCERT'ING, imp. DIS'CONCERT'ED, pp.

DISCONNECT, v. *dĭs'kŏn-nĕkt'* [L. *dis*, the opposite of, and *connect*]: to break the ties of anything; to separate. DIS'CONNEC'TING, imp. DIS'CONNEC'TED, pp.: ADJ. without coherence or continuity. DIS'CONNEC'TION, n. *-nĕk'-shŭn*, separation; want of union.

DISCONSOLATE, a. *dĭs-kŏn'sō-lāt* [L. *dis*, not; *consolātus*, comforted greatly, animated (see CONSOLE)]: without comfort; destitute of consolation; sorrowful; dejected; hopeless; cheerless. DISCON'SOLATELY, ad. *-lāt-lĭ*. DISCON'SOLATENESS, n. DISCON'SOLA'TION, n. *-lā'shŭn*, want of comfort.

DISCONTENT, a. *dĭs'kŏn-tĕnt'*, or DIS'CONTENT'ED [L. *dis*, not, and *content*]: not content; uneasy in mind; unquiet; dissatisfied: N. dissatisfaction; uneasiness; want of content. DIS'CONTENT'EDLY, ad. *-lĭ*. DIS'CONTENT'EDNESS, n. DIS'CONTENT'ING, a. giving no satisfaction; giving uneasiness. DIS'CONTENT'MENT, n. the state of being uneasy in mind.

DISCONTINUE, v. *dĭs'kŏn-tĭn'ū* [L. *dis*, not, and *continue:* F. *discontinuer*, to discontinue—*lit.*, to lose the cohesion of parts]: to break the continuance of; to leave off; to cause to cease; to abandon; to break off; to cease. DIS'CONTIN'UING, imp. DIS'CONTIN'UED, pp. *-ūd*. DIS'CONTIN'UANCE, n. *-ū-ăns*, or DIS'CONTINUA'TION, n. *-ū-ā'shŭn*, cessation; interruption. DISCONTINUEE', n. *-tĭn-ū-ē'*, one whose possession of an estate is broken off or discontinued, one whose estate is subject to discontinuance. DISCONTIN'UOR, n. *-ĕr*, one who deprives another of an estate by discontinuance. DIS'CONTINU'ITY, n. *-tĭ-nū'ĭ-tĭ*, disunion of parts; want of cohesion. DIS'CONTIN'UOUS, a. *-tĭn'ū-ŭs*, wanting in cohesion or continuity; gaping wide.—SYN of 'discontinuance': intermission; disunion; separation; disruption; disjunction; termination.

DISCOPHORA, n. plu. *dĭs-kŏf'ŏ-ră* [Gr. *diskos*, a quoit; *phorĕō*, I carry]: an order of the medusæ or jelly-fish, so called from their form; an order of leeches which possess sucking-disks.

DISCORBINA, n. *dĭs-kawr-bī'na* [L. *discus*, a disk; *orbis*, a circle]: one of the *Rotalinæ*, having a turbinoid

spire, with vesicular chambers, opening one into the other by slit-like apertures. The shell is occasionally coarsely, sometimes finely, and occasionally partially porous.

DISCORD, n. *dĭs'kawrd* [F. *discord;* OF. *descord*—from L. *discordĭă*, disunion—from *dis*, asunder; *cordem*, the heart]: disagreement among persons; variance; strife; contention; a dissonant combination of tones; the absence of harmony; applied to sounds having no harmonical relation whatever; thus differing from *Dissonance*, which in music is applied to sounds in grammatically correct relation to each other though not consonant. Discord produces a craving for resolution into something more restful, satisfying and final. The resolution consists in movement toward combinations of consonant tones. See CHORD; HARMONY; CONSONANCE AND DISSONANCE; INTERVAL. DISCOR'DANT, a. *-kŏr'dănt* [F.—L.]: at variance with itself; disagreeing; not harmonious; harsh; jarring. DISCOR'DANTLY, ad. *-lĭ*. DISCOR'DANCE, n. *-dăns* [F.—L.], or DISCOR'DANCY, n. *-dăn-sĭ*, disagreement; opposition. DISCOR'DING, a. disagreeing; inharmonious. DISCORD'FUL, a. in *OE.*, quarrelsome.—SYN. of 'discord': difference; opposition; dissension; clashing; dissonance; disagreement; disharmony; jarring;—of 'discordant': dissonant, inharmonious; incongruous; contradictory; repugnant; opposite; contrary.

DISCOUNSEL, v. *dĭs-kown'sĕl* [L. *dis*, opposite of, and *counsel*]: in *OE.*, to give opposite counsel or advice; to dissuade.

DISCOUNT, n. *dĭs'kownt* [OF. *descompter*, to make a back reckoning; *descompte;* F. *décompte*, abatement—from F. *des* for L. *dis*, apart, away: F. *compter*, to count—from L. *computārĕ*, to count]: something taken off or deducted; an allowance or deduction on the payment of money; deduction of the interest on a sum lent at the time of lending; the sum so deducted. DISCOUNT', v., sometimes DIS'-, to lend the amount named on a bill or note of exchange, less the interest for the time it has to run, at a certain rate per $100; *figuratively*, to draw beforehand on something expected, it may be at a loss. DISCOUNT'ING, imp. DISCOUNT'ED, pp. DISCOUNT'ER, n. one who discounts, or advances money on bills or notes of exchange. DISCOUNT'ABLE, a. *-ă-bl*, that may be discounted. Discount is the amount deducted from the face value of a bill of exchange or promissory note, as the price for cashing it to the payee so many months or weeks before it is payable by the person who is primarily responsible for its payment. Bank discount is simple interest on the face value of a promissory note, and deducted from the face value, instead of being reckoned on the amount advanced. True discount is such an amount deducted, as would be simple interest on the amount advanced, for the time specified in the note.

The allowance made to a trader, under the name of discount, for prepayment of a debt, is usually greater than the current rate of interest, as the creditor receiving the money

before it becomes due, secures himself against the insolvency of the debtor.

The rates of discount vary according to the demand for money and the nature of the security. The range in Britain is from 3 to 10 per cent., except in the case of doubtful bills or post obits bonds, when a much higher rate is exacted. Bills at and under three months' currency are usually charged a per cent. less than those of a long date. In the British colonies higher rates are allowed. In the United States rates vary in the different states; in the large eastern cities the average, formerly much higher than in Britain, is still somewhat higher; in the western states it is much higher.

DISCOUNTENANCE, v. *dĭs-kown'tĕ-năns* [L. *dis*, not, and *countenance:* OF. *descontenancer*, to abash]: to discourage; to restrain by cold treatment, frowns, or arguments: N. cold treatment; unfriendly regard; disapprobation. DISCOUN'TENANCING, imp. DISCOUN'TENANCED, pp. *-năns*t. DISCOUN'TENANCER, n. *-năn-sẽr*, one who.

DISCOURAGE, v. *dĭs-kŭr'āj* [L. *dis*, not, and *courage:* OF. *descourager*, to dishearten]: to depress the spirits; to dishearten; to dissuade; to deter from. DISCOUR'AGING, imp. DISCOUR'AGED, pp. *-ājd*. DISCOUR'AGEMENT, n. *-āj-mĕnt*, the act of depriving of confidence; that which destroys or depresses courage; anything which deters from. DISCOUR'AGINGLY, ad. *-lĭ*. DISCOUR'AGER, n. *-ā-jẽr*, one who disheartens or depresses the courage of another.—SYN. of 'discourage': to deter; depress; dispirit; deject; disfavor; discountenance.

DISCOURSE, n. *dĭs-kōrs'* [F. *discours*—from mid. L. *discursus*, conversation, discussion—from L. *dis*, asunder, *cursus*, a running: It. *discorso*, speech—*lit.*, a running or shaking about or over a thing]: conversation; communication of thoughts by words; a treatise; a dissertation; a sermon: V. to talk or converse; to reason; to treat of; to converse formally. DISCOUR'SING, imp. DISCOURSED', pp. *-kōrst'*. DISCOUR'SER, n. *-sẽr*, one who. DISCOUR'SIVE, a. *-kor'sĭv*, reasoning; containing dialogue; communicative.—SYN. of 'discourse, n.': colloquy; conference; dialogue; speech; language; talk; homily; lecture.

DISCOURTEOUS, a. *dĭs-kẽrt'e-ŭs* or *dĭs-kẽrt'yŭs* [L. *dis*, not, and *courteous:* OF. *discortois*, discourteous]: rude; uncivil; wanting in good manners. DISCOURT'EOUSNESS, n. *-kẽr'tĕ-ŭs-nĕs* or *-kẽrt'yŭs-nĕs*, the state of being discourteous; incivility. DISCOURT'EOUSLY, ad. *-lĭ*, in a discourteous manner; uncivilly. DISCOUR'TESY, n. *-kẽr'tĭ-sĭ*, rudeness of behavior or language; incivility; ill manners.

DISCOUS: see under DISK.

DISCOVER, v. *dĭs-kŭv'ẽr* [L. *dis*, and *cover:* OF. *discouvrir*, to discover]: to lay open to view; to reveal or make known; to bring to light; to find out, as by labor or research; to have the first sight of; to detect. DISCOV'ERING, imp. DISCOV'ERED, pp. *-ẽrd*. DISCOV'ERER, n. one who. DISCOV'ERABLE, a. *-ẽr-ă-bl*, that may be found out or

made known. DISCOV'ERY, n. *-ĕr-ĭ*, a bringing to light or making known; that which is made known; the act of finding out; the thing found out or revealed.—SYN. of 'discover': to disclose; divulge; reveal; uncover; tell; exhibit; show; manifest; communicate; impart; espy; ascertain.

DISCOVERY, BILL OF: process of a court directing the defendant in a suit to disclose certain facts within his knowledge, or to produce specified deeds, writings, books, or other things in his power or possession, in order to maintain the right or title of the party asking it in some proceeding in another court. The person on whom the demand is made is protected by the court of which the bill is asked against improper proceedings. He cannot be compelled to make the discovery when the act would subject him to criminal proceedings or to a forfeiture, and he can interpose objections on the grounds that the plaintiff has no interest in the subject-matter or title to the discovery required, that he is not bound to discover his own title, that the discovery is not material in the suit, that the defendant is not answerable to the plaintiff, but that some other person has the right to call for the discovery, and many others. In the United States this form of proceeding is almost entirely abolished, and in practice either party may nearly everywhere obtain a judicial order for the examination of a party to an action before trial. Beside that, both parties may be made witnesses, and compelled by a simple order of the court to produce any books, papers, or other things deemed material to the proceeding.

DISCREDIT, n. *dĭs-krĕd'ĭt* [F. *discrédit*, disrepute—from L. *dis*, not; *crēdĭtus*, trusted, believed]: want or loss of credit; disgrace; reproach; dishonor; want of good reputation or credit: V. not to believe or credit; to esteem of no importance; to disgrace; to deprive of credibility; to make less reputable or honorable. DISCRED'ITING, imp. DISCRED'ITED, pp. DISCRED'ITABLE, a. *-ĭt-ă-bl*, disgraceful; disreputable; injurious to good name. DISCRED'ITABLY, ad. *-ă-blĭ*.—SYN. of 'discredit, n.': disesteem; disrepute; scandal; disbelief; distrust.

DISCREET, a. *dĭs-krēt'* [F. *discret*, prudent—from L. *discrētus*, separated, distinguished—from *dis*, *crētus*, distinguished]: prudent; not rash; wise in avoiding errors or evil; modest; circumspect. DISCREET'LY, ad. *-lĭ*, in a discreet manner; prudently. DISCREET'NESS, n. the quality of being discreet. DISCRETION, n. *dĭs-krĕsh'ŭn* [F.—L.]: prudence; wise conduct and management; good discernment; liberty or power of acting without control; unconditional power over, as *at his own discretion*. DISCRE'TIONARY, a. *-ĕr-ĭ*, unrestrained; left in certain circumstances to act according to one's own judgment, as an ambassador with *discretionary powers*. TO SURRENDER AT DISCRETION, a submit without terms.

DISCREPANCE, n. *dĭs-krĕp'ăns* or *dĭs'-*, or DISCREP'ANCY, n. *-ăn-sĭ* [L. *discrep'ens*, or *discrepen'tem*—from *dis*, intensive; *crĕpans*, creaking, jarring: It. *discrepanza*]: dis-

agreement; difference; contrariety. DISCREP'ANT, a. *-ănt*, disagreeing; contrary.

DISCRETE, a. *dĭs-krēt'* [L. *discrētus*, separated—from *dis*, asunder; *crētus*, separated (see DISCREET)]: distinct; disjoined; not continuous. DISCRE'TIVE, a. *-krē'tĭv*, disjunctive; denoting separation or opposition. DISCRE'TIVELY, ad. *-lĭ*.

DISCRETION, DISCRETIONARY: see under DISCREET.

DISCRIMINATE, v. *dĭs-krĭm'ĭ-nāt* [L. *discrimĭnātus*, divided, separated—from *discrīmen*, that which separates or divides two things—from *dis*, asunder; *cerno*, I separate]: to observe and mark the difference between; to distinguish, as by some note or mark; to make a difference or distinction. DISCRIM'INATING, imp. DISCRIM'INATED, pp. DISCRIM'INATOR, n. *-nā-tėr*, one who. DISCRIM'INA'TINGLY, ad. *-lĭ*. DISCRIM'INATIVE, a. *-nā-tĭv*, that makes or observes the mark of distinction or difference. DISCRIM'INA'TIVELY, ad. *-lĭ*. DISCRIM'INA'TION, n. *-shŭn*, the act of distinguishing; the state of being distinguished; the faculty of distinguishing; acuteness; discernment. In *Psychology*, the process in the mind, or the ability, whereby a conscious being explicitly marks off one phase of experience from another. As when one shows discrimination by distinguishing red from green, the idea of being from the idea of not-being. Usually involves comparison and always gives evidence of completed analysis of some kind. DISCRIM'INA'TORY, a. *-tėr-ĭ* that makes the mark of distinction.—SYN. of 'discrimination': penetration; judgment; discretion; clearness; distinction.

DISCROWN, v. *dĭs-krown'* [L. *dis*, and *crown*]: to depose a sovereign; to deprive a sovereign of his crown.

DISCUBITORY, a. *dis-kū'bĭ-tėr-ĭ* [L.L. *discubitorius*—from L. *discumbo*, I lie down]: fitted or intended for the posture of leaning or reclining.

DISCUMBENCY, n. *dĭs-kŭm'bėn-sĭ* [L. *discumbens*, p.pr. of *discumbo*, I lie down]: the act or practice of reclining at meals, after the fashion of the ancients.

DISCURE, v. *dĭs-kūr'* [F. *découvrir*, to uncover]: in *OE.*, to discover; to reveal. DISCU'RING, imp. DISCURED', pp. *-kūrd'*.

DISCURSIVE, a. *dĭs-kėr'sĭv* [F. *discursif*—from mid. L. *discursus*, discussion—from L. *dis*, asunder; *cursus*, a. running—*lit.*, moving to and fro from one thing to another]: irregular; moving about; desultory; argumentative. DISCUR'SIVELY, ad. *-lĭ*. DISCUR'SIVENESS, n.

DISCUS, n. *dĭs'kŭs* [L. *discus.;* Gr. *diskos*, a round plate of metal or stone (see DISK)]: a flat piece of metal or stone to be thrown in play; a quoit.

DISCUSS, v. *dĭs-kŭs'* [L. *discussus*, struck asunder, dispersed—from *dis*, asunder; *quassus*, shaken: F. *discussif*, discussive: It. *discussare*, to examine, to sift—*lit.*, to shake and examine on all sides]: to debate; to argue a question

with the view of clearing it of doubts and difficulties; to divide and consume an article of food or drink, as to *discuss a fowl, of bottle of wine,* etc. DISCUS'SING, imp. DISCUSSED', pp. *-kŭst'*. DISCUS'SION, n. *-kŭsh'ŭn* [F.—L.]: a debate; the arguing of a point with the view to elicit truth.

DISCUS'SIVE, a. *-kŭs'sĭv,* having the power to resolve; having the power to dissolve or disperse, as a tumor: N. a medicine that disperses a tumor. DISCUS'SER, n. *-sẽr,* one who, or that which—SYN. of 'discuss': to argue; dispute; deliberate; contend; examine; ventilate; sift; search.

DISCUS'SION, in Scotch Law: technical term for the act of the creditor in demanding and, so far as possible, enforcing, payment from the principal debtor, first.

DISCUTIENT, a. *dĭs-kū'shĭ-ĕnt* or *dĭs-kū'shĕnt* [L. *discutĭen'tem,* striking asunder (see DISCUSS)]: dispersing morbid matter: N. a medicine or application which disperses a tumor.

DISDAIN, v. *dĭs-dān'* [OF. *desdaigner;* F. *dédaigner*—from It. *disdegnare,* to despise, to treat with disdain—from L. *dis,* not; *dignus,* worthy]: to deem worthless; to consider to be unworthy of notice, etc.; to scorn; to contemn; to despise: N. contempt; scorn; detestation of what is mean and dishonorable. DISDAIN'ING, imp. DISDAINED', pp. *-dānd'*. DISDAIN'FUL, a. *-fûl,* expressing disdain. DISDAIN'FULLY, ad. *-lĭ*. DISDAIN'FULNESS, n. haughty scorn; contempt:—SYN. of 'disdain, n.': haughtiness; pride; arrogance.

DISDIAPASON, n. *dĭs-dī-a-pā'zon* [Gr. *dis,* twice, twofold; Eng. *diapason* (q.v.)]: in *music,* an interval of two octaves; a fifteenth. It is also written *Bisdiapason.*

DISEASE, n. *dĭz-ēz'* [OF. *desaise,* sickness—from *des* for L. *dis,* apart; F. *aise;* It. *agio,* ease, convenience (see EASE)—*lit.,* the want of ease]: any deviation from health; sickness; illness; disorder in any part of the body or mind. In a strictly scientific sense, there may be disease without pain or uneasiness in the ordinary meaning of these words, but hardly without functional disturbance or incapacity of some kind. It is, therefore, necessary to include in the definition of disease only the diminution of functional power, whether attended or not by suffering, and the scientific and practical ideas of the word will closely correspond. Many authorities have generalized disease into a separate active principle, opposed to, and everywhere seeking to destroy, the principle of health; and Paracelsus was hardly more open to objection on the ground of absurdity than many others of his countrymen, when, in his picturesque, and at the same time mystical manner, he endowed the vital principle with a kind of personality, and spoke of disease as due to the whims and caprices of a displeased and resentful Archæus, a notion still further developed by Van Helmont. Commonly it is popular to speak of diseases as organic and functional; organic diseases having attached to them definite structural changes in the organs affected; functional diseases being understood

as diseases in which no such structural changes are demonstrable. This is a purely artificial distinction, however, and on close analysis cannot be maintained. Diseases are classified in general for purposes of general inquiry, particularly as to the statistical studies for economic purposes such as are involved in tabulation of cases of death, by health boards, for hospital returns, and for medical departments in the army and navy. These classifications are of great importance for the gathering of much useful information, but they are naturally subject to much change, as new discoveries ally certain heretofore apparently unrelated diseases under common heads. The classification and arrangement of diseases according to their external characters has been termed Nosology (q.v.); while the observation of their more intimate and less superficial relations in connection with their causes and results, is called Pathology (q.v.); both of these sciences, of course, being kept in view in the healing art or Medicine (q.v.), of the more practical portion of which these are the pillars. DISEASE, v. to afflict with disease; to impair any part of the body; to make morbid. DISEAS'ING, imp. DISEASED', pp. *-ēzd'*. DISEAS'EDNESS, n. *-ēz'ĕd-nĕs*, the state of being diseased; a morbid state.—SYN. of 'disease, n.': ailment; disorder; distemper; malady; complaint; indisposition. DISEASES OF SPEECH. See SPEECH AND ITS DISEASES.

DISEASES OF PLANTS. See PLANTS, DISEASES OF.

DISEDGE, v. *dĭs-ĕj'* [L. *dis*, not, and *edge*]: to deprive of an edge; to blunt; to dull.

DISEMBARK, see DEBARK.

DISEMBARRASS, v. *dĭs'ĕm-băr'răs* [OF. *desembarrasser*—from *des* for L. *dis*, asunder; *embarrasser*, to embarrass (see EMBARRASS)]: to free from difficulty or perplexity. DIS'EMBAR'RASSMENT, n. the act of extricating from difficulty or perplexity.

DISEMBODY, v. *dĭs'ĕm-bŏd'ĭ* [L. *dis*, asunder, and *embody*]: to free from the body; to discharge from military service, as soldiers or militia.

DISEMBOGUE, v. *dĭs'ĕm-bōg'* [Sp. *desembocar;* Norm. F. *désemboucher*, to flow into the sea—from Sp. *des* for L. *dis*, asunder, apart; Sp. *embocar*, to enter the mouth: F. *bouche*, mouth: L. *bucca*, the cheek when inflated]: to pour out at the mouth, as a river into a sea or lake; to vent; to flow out. DIS'EMBOG'UING, imp. *-bōg'ĭng*. DIS'EMBOGUED', pp. *-bōgd'*. DIS'EMBOGUE'MENT, n. *-bōg'mĕnt*, discharge of waters into the ocean or a lake. DISEMBOUCHURE, n. *dĭs-â ng'bô-shôr'* or *dĭs-ĕm'bô-shôr* [F. *embouchure*, the mouth of a river]: the mouth of a river; the discharge of the waters of a river.

DISEMBOWEL, v. *dĭs'ĕm-bow'ĕl* [L. *dis*, intensive, and *embowel*]: to take out the bowels; to deprive of the bowels. DIS'EMBOW'ELING, imp. DIS'EMBOW'ELED, pp. *-bow'ĕld:* ADJ. having the bowels taken or drawn out. DIS'EMBOW'ELMENT, n. the state of the person who has had his bowels drawn out.

DISEMBROIL, v. *dĭs'ĕm-broyl'* [L. *dis*, not, and *embroil*]: to free from confusion; to disentangle.

DISENCHANT, v. *dĭs'ĕn-chănt'* [L. *dis*, asunder, and *enchant:* F. *désenchanter*]: to deliver from the power of charms or spells; to free from fascination or delusion. DIS'ENCHANT'ER, n. one who, or that which. DIS'ENCHANT'MENT, n. act of disenchanting; state of being disenchanted.

DISENCUMBER, v. *dĭs'ĕn-kŭm'bẽr* [L. *dis*, the opposite of, and *encumber*]: to free from any obstruction or encumbrance. DIS'ENCUM'BRANCE, n. *brăns.*

DISENGAGE, v. *dĭs'ĕn-gāj'* [OF. *desengager*—from *des* for L. *dis*, asunder; *engager*, to engage (see ENGAGE)]: to free; to loose; to separate; to disunite; to clear from impediments; to liberate from a promise or obligation; to withdraw the affections. DIS'ENGA'GING, imp. DIS'ENGAGED', pp. *-gājd':* ADJ. being at leisure; not particularly occupied. DIS'ENGA'GEDNESS, n. *-gā'jĕd-nĕs.* DIS'ENGAGE'MENT, n. a setting free; state of being disengaged or set free.—SYN. of 'disengage': to extricate; detach; disentangle; liberate; clear; wean; withdraw; release.

DISENTAIL, v. *dĭs'ĕn-tāl* [L. *dis*, asunder, and *entail*]: to free land, etc., from the law of entail by a legal process.

DISENTANGLE, v. *dĭs'ĕn-tăng'gl* [L. *dis*, the opposite of, and *entangle*]: to unfold; to unravel; to set free from difficulties or impediments; to extricate. DIS'ENTAN'GLING, imp. DIS'ENTAN'GLED, pp. *-tăng'gld.* DIS'ENTAN'GLEMENT, n. *-gl-mĕnt.*—SYN. of 'disentangle': to disengage; detach; untwist; loose; disembarrass; evolve; clear; disembroil; separate; free.

DISENTHRALL: see DISINTHRALL.

DISENTHRONE, v. *dĭs'ĕn-thrōn'* [L. *dis*, asunder, and *enthrone*]: to depose from sovereign power.

DISENTOMB, v. *dĭs'ĕn-tôm'* [L. *dis*, and *entomb*]: to take out of a tomb; to disinter.

DISESPOUSE, v. *dĭs'ĕs-powz'* [L. *dis*, asunder, and *epouse*]: to release or separate after espousal, or after plighted faith.

DISESTABLISH, v. *dĭs'ĕs-tăb'lĭsh* [L. *dis*, asunder, and *establish*]: to remove from being established; to unsettle; to overthrow. DIS'ESTAB'LISHMENT, n. the act of removing from being established or connected with the state, as a national church.

DISESTEEM, n. *dĭs'ĕs-tēm'* [L. *dis*, and *esteem*]: want of esteem; slight dislike: V. to consider with disregard or slight contempt.

DISFAVOR, n. *dĭs-fā'vẽr* [L. *dis*, and *favor:* F. *défaveur*]: the state of being not acceptable; dislike; displeasure in a slight degree; a disobliging or ill act; want of beauty: V. to withhold countenance or support; to show disapprobation.

DISFIGURE, n. *dĭs-fĭg'ŭr* [OF. *desfigurer*—from *des* for *dis*, asunder; *figurer*, to figure (see FIGURE)]: to mar or

injure the external appearance of a person or thing; to impair shape, beauty, or excellence. DISFIG'URING, imp. DISFIG'URED, pp. a. *-ŭrd*, changed to a worse form or appearance; impaired. DISFIG'UREMENT, n. DISFIG'URA'TION, n. *-ū-rā'shŭn*, the act of marring or injuring external form; state of being disfigured.—SYN. of 'disfigure': to deface; deform; mar; injure.

DISFOREST, v. *dĭs-fŏr'ĕst* [L. *dis*, asunder, and *forest*]: to reduce from the privileges of a forest to the state of common ground; to throw open to common purposes;

DISFRANCHISE, v. *dĭs-frăn'chĭz* [L. *dis*, asunder, and *franchise*]: to deprive of a charter; to deprive of the right of voting; to deprive of the rights of a free citizen; to deprive a town of its privilege of sending a representative to a legislature. DISFRAN'CHISING, imp. *-chĭz-ĭng*. DISFRAN'CHISED, pp. *-chĭzd*, deprived of certain rights and privileges. DISFRAN'CHISEMENT, n. *-chĭz-mĕnt*, the act of depriving of certain rights and privileges.

DISFURNISH, v. *dĭs-fĕr'nĭsh* [L. *dis*, asunder, and *furnish*]: to strip of furniture, apparatus, etc.; to deprive of.

DISGORGE, v. *dĭs-gŏrj'* [F. *dégorger;* OF. *desgorger*—from *des* for L. *dis*, asunder, and *gorge* (see GORGE)]: to eject from the stomach, etc.; to vomit; to pour forth; to yield up unwillingly what has been improperly or unjustly taken possession of. DISGORGE'MENT, n. the act of disgorging or yielding up unwillingly; the thing so yielded.

DISGRACE, n. *dĭs-grās'* [F. *disgrâce*—from L. *dis*, asunder; F. *grâce*—from L. *grātĭă*, grace, favor]: state of being out of favor; shame; dishonor; great discredit; cause of shame: V. to put out of favor; to dishonor; to bring reproach upon; to bring to shame. DISGRA'CING, imp. DISGRACED', pp. *-grāst'*. DISGRACE'FUL, a. *-fûl*, shameful; dishonorable. DISGRACE'FULLY, ad. *-lĭ*. DISGRACE'FULNESS, n. ignominy; shamefulness. DISGRACIOUS, a. *dĭs-grā'shŭs*, ungracious; unpleasing.—SYN. of 'disgrace, n.': discredit; opprobrium; disesteem; disfavor; reproach; ignominy; disparagement; reproach; infamy;—of 'disgrace, v.': to discredit; degrade; abase; disparage; defame; debase.

DISGUISE, v. *dĭs-gīz'* [OF. *desguiser;* F. *déguiser*, to conceal or dissemble—from F. *des* for L. *dis*, apart; *guise*, manner, fashion (see GUISE)]: to conceal the personal appearance by changing the outward attire; to hide the feelings by an unusual or assumed appearance; to alter the form of: N. a dress intended to conceal the person; a mask; a false appearance or show. DISGUI'SING, imp. DISGUISED', pp, *-gīzd'*. DISGUI'SER, n. *-zer*, one who. DISGUI'SEDLY, ad. *-gī'zĕd-lĭ*. DISGUISEMENT, n. *dĭs-gīz'mĕnt*, dress of concealment.—SYN. of 'disguise, v.': to dissemble; secrete; conceal; hide; falsify; counterfeit; masque.

DISGUST, n. *dĭs-gŭst'* [OF. *desgoust*, disgust—from It. *disgusto*—from L. *dis*, asunder; *gustus*, a taste, a relish: F. *dégouter*, to disgust]: aversion to food or drink or anything disagreeable; aversion or strong dislike, excitedly by the conduct or manners of others: V. to excite aversion in; to

displease; to offend the mind. DISGUST'ING, imp.: ADJ.: exciting disgust; highly displeasing. DISGUST'ED, pp. DISGUST'INGLY, ad. *-lĭ.* DISGUST'FUL, a. *-fûl,* causing disgust; nauseous; hateful. DISGUST'FULLY, ad.- *lĭ.* DISGUST'FULNESS, n.—SYN. of 'disgust, n.': dislike; aversion; distaste; disinclination; repugnance; displeasure.

DISH, n. *dĭsh* [AS. *disc,* a plate: L. *discus,* a flat circle of stone, wood, or metal: Gr. *diskos,* a tray: Ger. *tisch,* a table]: any article of domestic use, broad and open, used for serving up food; also the contents of any such vessel; a sort of trough in which miners measure ore: V. to put into a dish. DISH'ING, imp. DISHED, pp. *dĭsht.* DISH-CLOTH or DISH-CLOUT, *-klowt,* a cloth used for washing or wiping dishes. DISH-COVER, a cover of metal or earthenware for retaining the heat. DISH-WATER, warm water in which dishes are washed. DISH'FUL, n. *-fûl,* as much as a dish can hold.

DISH, v. *dĭsh* [Gael. *disne,* a die, dice; *disnein,* a dice-box: Scot. *dish,* to render useless]: in *OE.* and *familiar slang,* to render useless; to do for; to ruin. DISHED, a. *dĭsht,* having thrown the die and lost; rendered useless; done for; ruined. DISHED OUT OF IT, deprived of it by unfair means; cheated out of it. *Note.*—DISH is perhaps only a provincial pronunciation of DIGHT, which see.

DISHABILLE, n. *dĭs'ă-bēl':* an *OE.* spelling of DESHABILLE, which see; a loose dress.

DISHABIT, v. *dĭs-hăb'ĭt* [L. *dĭs,* asunder, and *habit*]: in *OE.,* to throw out of its usual and proper place; to drive from a dwelling. DISHAB'ITING, imp. DISHAB'ITED, pp. *-ĭ-tĕd.*

DISHEARTEN, v. *dĭs-hârt'n* [L. *dis,* asunder, and *heart*]: to discourage; to depress; to impress with dread or fear. DISHEART'ENING, imp. *-hârt'nĭng.* DISHEART'ENED pp. *-hârt'nd.*—SYN. of 'dishearten': to deter; dispirit; deject; terrify.

DISHEVEL, v. *dĭ-shĕv'ĕl* [OF. *descheveler;* F. *décheveler,* to spread the hair in disorder—from F. *cheveu;* OF. *chevel;* L. *capillus,* a hair, the hair]: to spread the hair loosely, or to suffer it to hang so; to disorder the hair. DISHEV'ELING, imp. DISHEV'ELLED, pp. *-ĕld,* spread or flowing in disorder.

DISHING: see under DISH 1.

DISHONEST, a. *dĭs-ŏn'ĕst* [OF. *deshonneste*—from *des* for L. *dis,* not; *honneste,* honest]: not trustworthy; faithless; fraudulent; having a disposition to cheat or defraud; disgraceful; in *OE.,* unchaste; lewd. DISHON'ESTLY, ad. *-lĭ.* DISHON'ESTY, n. *-tĭ;* a disposition to defraud or cheat; deceit; betrayal of trust; faithlessness; want of integrity.

DISHONOR, n. *dĭs-ŏn'ĕr* [F. *deshonneur,* dishonor, and *deshonorer,* to dishonor—from *des* for L. *dis,* apart; *honneur,* honor (see HONOR)]: want or loss of honor; disgrace; any stain or blemish on the reputation; shame; ignominy: V. to disgrace; to bring reproach or shame upon; to lessen repu-

tation; to degrade; to seduce; to fail to meet an acceptance or bill of exchange. DISHON'ORING, imp. DISHON'ORED, pp. *-ẽrd*. DISHON'ORER, n. *-ẽr-ẽr*, one who. DISHON'ORABLE, a. *-ẽr-ă-bl*, shameful; disgraceful; base; approaching to vileness; destitute of honor. DISHON'ORABLY, ad. *-blĭ*. DISHON'ORABLENESS, n. *-bl-nĕs*.—SYN. of 'dishonor, n.': reproach; discredit; igominy; censure; opprobrium;—of 'dishonor, v.': to shame; debase; debauch; pollute; stain; violate.

DIS'HONOR OF A BILL: refusal or failure to meet a bill. When the drawee (person on whom a bill is drawn) declines to accept it or to pay it, he is said to dishonor it. The act of drawing or of indorsing a bill implies an obligation to pay it in the last instance, and the person in whose favor it is drawn has thus recourse against the drawer and indorsers, should the drawee fail to accept or to pay. In order to preserve this recourse, however, it is indispensable that notice of dishonor be given to the drawer and indorsers. No particular form of notice is requisite. The notice must be such as to identify the bill, and to inform the party to whom it is given of the protest, a copy of which ought to accompany it. If the notice is put into the post-office, and properly addressed, it is sufficient; even verbal notice, if clear, will suffice. In the case of foreign bills, the period within which notice must be given is regulated by the usages and customs of merchants. Any delay which can fairly be ascribed to neglect or omission, and is not justified by the circumstances of the case, will be fatal to the bill-holder's claim for recourse. In inland bills and notes, notice must, in the general case, be sent the next day, where the parties reside in the same place, and by the next mail, if they reside at a distance.

DISHORN, v. *dĭs-hawrn'* [L. *dis*, asunder, and *horn*]: to deprive or strip of horns.

DISIDÆ, n. plu. *dī'sĭ-dē:* family of orchids, tribe *Ophreæ*.

DISINCLINE, v. *dĭs'ĭn-klīn'* [L. *dis*, not, and *incline*]: to dislike; to excite a slight aversion to; to make disaffected. DIS'INCLI'NING, imp. DIS'INCLINED', pp. *-klīnd'*. DISINCLINATION, n. *dĭs'ĭn-klĭ-nā'shŭn*, dislike or slight aversion to; want of desire or affection for.—SYN. of 'disinclination': disaffection; alienation; unwillingness; dislike; aversion; repugnance.

DISINCORPORATE, v. *dĭs'ĭn-kŏr'pō'rāt* [L. *dis*, asunder, and *incorporate*]: to deprive of corporate powers. DIS'INCORPORA'TION, n. *-rā'shŭn*, deprivation of the rights and privileges enjoyed by a corporate body.

DISINFECT, v. *dĭs'ĭn-fĕkt'* [L. *dis*, asunder, and *infect:* F. *désinfecter*]: to purify from contagious matter; to cleanse; to free from infection. DIS'INFEC'TING, imp. DIS'INFEC'TED, pp. DIS'INFEC'TION, n. *-fĕk'shŭn*, purification from contagious matter. DIS'INFEC'TANT, n. *-tănt*, a substance which destroys smells and their poisons by acting chem-

ically; any substance that destroys infection or infectious matter: see DEODORIZE. Disinfectants are, strictly speaking, agents which can prevent infectious diseases from spreading, by destroying their specific poisons. The term is, however, often loosely applied to all substances which destroy or neutralize bad odors, though not all such have the power of counteracting infection. Many infectious diseases have now been proved, and all are believed, like putrefaction (q.v.), to be due to special micro-organisms found in different parts of the body, and communicable in different ways in different diseases. See GERM THEORY. In order to disinfect thoroughly, the source of the infection must be known. This differs in different diseases; in the eruptive fevers, such as measles, scarlet fever, smallpox, etc., the infectious agent comes directly from the body, attaching itself to the clothing, bedclothes, etc., and to objects handled by the infected person; in pneumonia, tuberculosis, diphtheria, and whooping-cough, the sputum and the breath take the germ of infection; and in typhoid fever infection is largely due to the specific germ found in the discharges from the bowels and in the urine. Some of the infecting agents do not multiply outside of the body, while others under favorable conditions are very procreative; therefore the object of disinfection is to destroy all infected material and, where this is not admissible, to subject it to a process of disinfection inimical to the life of the infecting germ. The best and cheapest disinfectants are supplied by nature, namely, sunlight and air.

Fire and heat are the most powerful disinfectants known. In the use of heat various kinds of mechanical apparatus for both dry and moist (superheated steam) heating are used. Boiling infected clothes, with or without the addition of a chemical disinfectant, is a popular means of disinfection. Most cities and quarantine stations have established plants for steam disinfection. Clothing, bedding, etc., known or believed to be infected are placed in chambers or cylinders and subjected to a pressure of superheated steam (220° to 230° F.) for 20 or 30 minutes. This thoroughly disinfects all infected material. Dry heat is not so effective. Cold (freezing) is a natural disinfectant, but often fails, especially in the case of typhoid germs, which have been known to resist freezing after 103 days; and the same is true of the tuberculosis germ. A disinfectant much used for all practical and domestic purposes, both inexpensive and easy of application, is chloride of lime in the proportion of six ounces to a gallon of water. All typhoid or cholera stools, likewise the sputum of pneumonia or tuberculosis patients are rendered innocuous by it in less than 30 minutes. Carbolic acid in the proportion of four ounces to a gallon of water will destroy most bacilli, but not their spores. It is highly poisonous, and very destructive to the skin, therefore to be used with caution. Corrosive sublimate, in proportion of one part to 1,000 parts water, and common whitewash are also used as disinfectants. Chlorine and sulphurous gases are objection-

able because of their irritating qualities. Sulphur fumes are falling into disuse in consequence of the foul odor and failure to accomplish the end sought. A more modern disinfectant is formalin, made by subjecting methyl-alcohol to oxidation. It is readily soluble in water, does not destroy clothing or furniture, and is virtually non-poisonous; it is used for disinfecting surgical instruments, and dwelling-rooms. Solid formaldehyde being introduced into a generator and burned, the resulting gas quickly penetrates all cracks and crevices and renders the air clean and pure, besides destroying infectious germs.

DISINGENUOUS, a. *dĭs'ĭn-jĕn'ū-ŭs* [L. *dis*, not, and *ingenuous*]: not open or candid; not frank; unfair; meanly artful. Dis'ingen'uously, ad. *-lĭ*. Dis'ingen'uousness, n., or Disin'genu'ity, n. *-jĕ-nū'ĭ-tĭ*, insincerity; want of candor.

DISINHERIT, v. *dĭs'ĭn-hĕr'ĭt* [L. *dis*, asunder, and *inherit*]: to cut off from an inheritance, to deprive of hereditary right. Dis'inher'iting, imp. Dis'inher'ited, pp. Dis'-inher'ison, n. *-hĕr'ĭ-sŭn*, or Dis'inher'itance, n. *-ĭ-tăns*, the act of cutting off from hereditary succession; the act of disinheriting; the state of being disinherited.

DISINTEGRATE, v. *dĭs-ĭn'tĕ-grāt* [L. *dis*, asunder; *intĕgrātus*, made anew or afresh—from *intĕger*, whole, entire (see Integer)]: to separate a whole body or substance by a gradual breaking into parts, as by the action of the atmosphere; to crumble. Disin'tegrating, imp. Disin'tegrated, pp. Disin'tegra'tion, n. *-grā'shŭn*, the wearing down of rocks by the action of air or moisture, or other atmospheric influences; the process by which any body is broken up into parts; the condition of being broken up into parts. Disin'tegrable, a. *-tĕ-grā-bl*, that may be separated into small portions.

DISINTER, v. *dĭs'ĭn-tĕr'* [L. *dis*, the opposite of, and *inter*]: to take out of the earth or grave; to unbury; to bring to light; to disclose what was formerly in obscurity. Dis'-inter'ring, imp. Dis'interred', pp. *tĕrd'*. Dis'inter'-ment, n. the act of taking out of the earth.

DISINTERESTED, a. *dĭs-ĭn'tĕr-ĕst-ĕd* [OF. *desinteressé*, discharged, lost all interest in—from *des* for L. *dis*, apart; *interessé*, interested in (see Interested)]: free from selfish motives; having no personal advantage; unbiassed. Dis-in'terest'edly, ad. *-lĭ*. Disin'terest'edness, n. the state of having no personal interest or advantage in a matter, freedom from bias or prejudice.—Syn. of 'disinterested': impartial; uninfluenced; uninterested; indifferent; unprejudiced.

DISINTHRALL, or Disenthrall, or Disinthral, v. *dĭs'ĕn-thrawl'* [L. *dis*, the opposite of, and *inthrall*]: to free from slavery or servitude; to rescue from oppression. Dis'-inthral'ling, imp. Dis'enthralled', pp. *-thrawld*. Dis'-inthral'ment, n. liberation from bondage.

DISJOIN, v. *dĭs-joyn'* [OF. *desjoindre*, to disunite—from L. *disjungĕrĕ*—from L. *dis*, asunder; *jungo*, I join (see

JOIN)]: to put asunder parts united or joined together; to part; to separate; to detach or sever. DISJOIN'ING, imp. DISJOINED', pp. *-joynd'*. DISJOINT', v. *-joynt'* [OF. *desjoinct*, parted]: to separate parts united by joints, to put out of joint; to break the natural order of a thing; to render incoherent; to fall in pieces: ADJ. in *OE.*, disjoined; fallen in pieces. DISJOINT'ING, imp. DISJOINT'ED, pp. unconnected; incoherent. DISJOINT'EDNESS, n. DISJOINT'LY, ad. *-lĭ*. DISJUNCT', a. *-jŭngkt'* [L. *junctus*, joined]: separated. DISJUNC'TION, n. *-jŭngk'shŭn* [F. *disjonction*—from L. *disjunctĭōnem*]: separation; a parting; disunion. DISJUNC'TIVE, a. *-tĭv*, separating; in *gram.*, that unites sentences, but disjoins the sense, as the words, *but, though;* in *logic*, having its parts set in opposition: N. in *gram.*, a word which disjoins. DISJUNC'TIVELY, ad. *-lĭ*.—SYN. of 'disjoin': to disconnect; divide; part; sever; sunder; disunite; dissever.

DISK, n. *dĭsk* [L. *discus*, a quoit (see DISH)]: any flattened or rounded body; the face of a heavenly body as it appears to us—as the sun or the moon; a piece of stone or metal inclining to a round or oval figure. In *bot.*, a fleshy expansion on which the floral organs are inserted in some flowers; a part intervening in some flowers between the stamens and the pistil. It is often a mere ring; sometimes it exhibits a whorl of scales or of rudimentary stamens, or even of petal-like appendages; sometimes it rises into a sort of cup around the pistil; sometimes, as in the rose, it assumes the form of a waxy lining of the tube of the calyx. It is often glandular, and secretes a honey-like fluid. It is one of the parts included under the vague comprehensive term *nectary* by the older botanists. *Disk* is also the receptacle of certain fungi, also the hymenium of others. DIS'COUS, a. *-kŭs*, broad; flat; wide. DISCIFORM, a. *dĭs'ĭ-fawrm* [L. *forma*, a shape]: in the form of a disk or flattened sphere; also DISCOID, a. *dĭs'-koyd* [Gr. *eidos*, form]: DISCOID PITH, in *bot.*, pith that forms disks with cavities between, as in the walnut.

DISLIKE, n. *dĭs-līk'* [L. *dis*, not, and *like*]: displeasure; aversion; a slight degree of hatred; antipathy; disrelish or distaste: V. to regard with displeasure or aversion; to regard with slight disgust; to disrelish. DISLI'KING, imp. DISLIKED, pp. *dĭs-līkt'*.—SYN. of 'dislike, n.': antipathy; repugnance; displeasure; disrelish; disapprobation; disinclination; disgust; disagreement; hate.

DISLOCATE, v. *dĭs'lō-kāt* [L. *dislocātus*, removed from its place—from *dis*, asunder; *locātus*, put or laid—from *locus*, a place]: to put out of joint; to move a bone from its socket or cavity. DIS'LOCATING, imp. DIS'LOCATED, pp. put out of joint. DIS'LOCA'TION, n. *-kā'shŭn* [F.—L.]: state of being put out of joint; the act of forcing a bone out of its socket, particularly as the result of accident; in *geol.*, displacement of stratified rocks from their original or horizontal position.

DISLOCATION: term in surgery, denoting the displacement of one bone from another with which it forms a

joint (*put out of joint* being the popular expression). Dislocation is generally the result of sudden accident but may be the result of disease, or may be congenital. The displacement may be *partial* or *complete;* and surgeons classify their cases into *simple* dislocations, when the skin remains unbroken; and compound, when there is a wound by which the external air may communicate with the joint. Occasionally, in addition to the dislocation, there are fractures of the bones, or lacerations of important blood-vessels in the neighborhood; it is then termed a complicated dislocation. Dislocation is a rare accident in infancy and old age, because in the former the joint ends of the bones are very flexible, and yield to violence; while the aged skeleton is so rigid that the brittle bones fracture under force that would drive younger and firmer ones out of their sockets. Dislocations are most frequent between the ages of 30 and 60. Persons with weak muscles, and lax, long ligaments, or those in whom the latter have been softened by inflammation of the joint, are predisposed to dislocation. The joints most frequently displaced are the shoulder and the elbow.

General symptoms of a dislocation.—After a blow, fall, or violent muscular exertion, a limb is found to be immovable at the injured joint, there is great pain, and the shape of the part is changed; but soon swelling ensues, and every distinctive mark about it is obscured. If left alone, or merely treated as an inflamed joint, the swelling gradually subsides; but the immobility continues, the limb is crippled for months or years, when at last nature forms a new socket for the end of the bone, and some amount of useful motion is restored. The proper shape of the part is never restored, but remains an eyesore to the patient, and a disgrace to the surgeon.

The general treatment of dislocations consists in their *reduction,* or pulling the displaced bone back into its place. Its return is opposed by the muscles attached to it, which are stimulated to contraction by the pain of the operation, which, requires, of course, a good deal of force to be employed. It is desirable to remove this spasm of the muscles, which is the great obstacle to the reduction of a dislocation; and in former days, bleeding from the arm, emetics, the warm bath, etc., were generally used; now chloroform or ether attains the same ends, and renders the treatment much more simple and humane than before the introduction of anæsthetics.

When the surgeon is about to reduce a dislocation requiring any degree of force, he fastens the part of the limb above the displaced bone or the trunk, so as to afford him *counter*-extension; he then pulls on the limb either with his hands, or with a bandage or handkerchief attached to it. The best way of fastening this is to roll a bandage, wetted, to prevent slipping, round the limb, and then taking the thing with which he wishes to extend in both hands, he casts it into two loops, forming what is called a *clove-hitch,* and then slips the double noose up the limb till it rests on

the wet bandage previously applied. In old standing cases, the hands grow weary before the extension has been kept up sufficiently long, so it is well to adapt pulleys to draw upon the clove-hitch, as with them the traction can be regulated as the surgeon desires. Sudden, forcible pulling is useless and hurtful, the object being merely to tire out the muscles which resist the attempts at reduction; when they are exhausted, the bone will generally slip back into its place with an audible snap. It is most important to relax the muscles in most forms of dislocation before reduction is attempted. The use of an anaesthetic is the surest and safest way to accomplish relaxation. After anaesthesia has taken place the reduction of most difficult dislocations is usually without trouble. Anaesthesia should always be resorted to where reduction meets with any resistance.

A class of shrewd individuals, called *'bone-setters,'* frequently derive profit from some conditions of joints which resemble dislocations. Chronic rheumatic inflammation is occasionally known to fix itself by an accident on some particular joint, especially the shoulder or hip, and may so change the surfaces of the bone-ends that they are spontaneously dislocated; the empiric, naturally antagonistic to the regular practitioner, tells the patient that when he met with the accident the dislocation occurred, but that his physician overlooked it. Again, many persons who have injured their joints do not submit to having them moved about, after the first inflammation has subsided. The bone-setter gives a forcible bend to the limb, which breaks up the adhesions; and because he has done roughly what the physician would have done equally well gently, the patient praises him, while he blames the one who guided his joint in safety through the first effects of the accident.

A dislocation should have immediate medical attention as the reduction is easier the earlier it is done; also skilful after-treatment is requisite to insure future usefulness of the joint.

To American surgeons belongs the honor of introducing the method of reduction of dislocation by manipulation. The study of dislocated parts on the cadaver has resulted in the formulation of the following rule applicable to *all* dislocations of the hip. *Flex the leg upon the thigh, and the thigh upon the body, carry the knee as far as possible in the direction it already points, rotate and circumduct in opposite direction and bring the leg down.* This is now the rule in all hospitals. See FRACTURES.

DISLOCATION, or FAULT, in Geology: a kind of displacement common among stratified rocks. The agency that raised these rocks above the waters of the sea, produced in the elevation numerous rents. In their simplest form, the rents are mere cracks, the parts, though separated, remaining contiguous; sometimes a greater or less fissure intervenes between the disunited portions, and this is filled with materials pressed in from above, or with ig-

neous rocks intruded from below. The beds, however, are not always found at the same level—a displacement as well as a severance often takes place, so that the beds on one side of the fissure or crack are many feet, or many hundreds of feet, above or below the beds on the other side

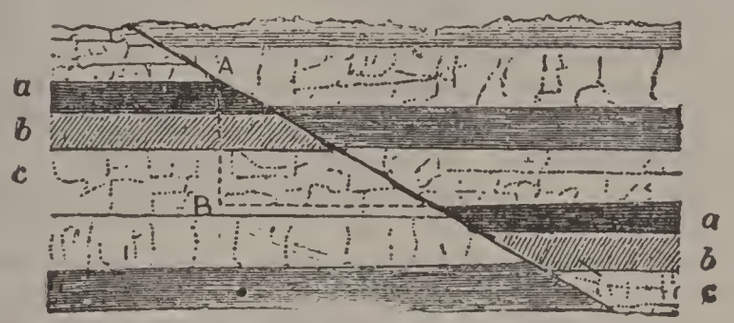


Diagram of Dislocated Strata.

with which they were once continuous. One of the best known faults is the 'Ninety Fathom Dike' in the Newcastle coal-field, England. The same beds are 90 fathoms lower on the n. than on the s. side. In the Edinburgh coal-field, the greatest fault is known as the 'Sheriffhall Slip.' It has produced a dislocation of the strata to the extent of 400 or 500 ft., so that the coal which is worked on the s. side of the slip, near the surface, is on the n. side 500 ft. below it. Mr. Milne Home enumerates 120 faults in the Mid-Lothian and East-Lothian coal-fields. He has himself examined 78 of these, and has found that 35 dip to the s., and 43 to the n.; and that while the sum of the down-throws by the faults dipping to the s. is 385 fathoms, those to the n. are 754 fathoms. For a 20,000-ft. fault in Pennsylvania, see Dana's *Manual*.

Faults in coal-fields are well known, because of their serious interference with the progress of the miner. But though they often cause considerable labor and expense in searching for the continuation of a valuable seam of coal, they have corresponding advantages, since they disclose on the surface the value of the buried minerals, and when filled with solid materials, they form embankments which confine water, and thus save expense in draining the mine.

The amount of dislocation is the measure of a line drawn from one part of the bed, at right angles to its plane, to a line produced from the other separated part of the bed representing its plane. Thus, in the diagram, AB shows the extent of the down-throw, say 10 ft. Although no notion can be formed in meeting with a fault, of the extent of dislocation, yet the direction in which the lost strata are to be sought can be certainly determined, for it has been found to be an invariable law, that the strata are lowest on the overlapping side of the slip, so that in the diagram the beds *a*, *b*, *c* are 10 ft. deeper in the overlying side than the same beds on the other. Faults have local names from the miners, all of which have been used by geologists. They are called hitches, dikes, troubles, slips, slides, heaves and throws.

DISLODGE, v. *dĭs-lŏj′* [OF. *desloger*—from *des* for L. *dis*, apart; *loger*, to lodge]: to remove or drive from a lodgment or place of rest; to drive from any place of rest or retirement, or from a station. DISLODG′ING, imp. DISLODGED′, pp. *-lŏjd′*. DISLODG′MENT, n. act of dislodging or removing to another place.

DISLOYAL, a. *dĭs-loy′ăl* [OF. *desloyal*—from *des* for L. *dis*, apart, and *loyal*]: false to a sovereign or to any superior, friend or associate; faithless; false; treacherous. DISLOY′ALLY, ad. *-lĭ*. DISLOY′ALTY, n. *-tĭ*, want of fidelity to a sovereign.—SYN. of 'disloyal': disaffected; perfidious; inconstant; dishonest; treacherous; disobedient; unfaithful.

DISMAL, a. *dĭz′măl* [Swiss, *dusem*, dark, down-hearted: Bav. *dusam*, dull; prov. Dan. *dussem*, slumber]: dreary; dark; gloomy; sorrowful; frightful. DIS′MALLY, ad. *-lĭ*. DIS′MALNESS, n. the state of being dismal; gloominess. DISMAL DAYS, in *OE.*, unlucky days. *Note.*—It is possible that the OE. *in the dismal* was equivalent to *in the tithing time*, referring to the cruel extortions practiced by the feudal lords in exacting the tithes from their vassals: OF. *disme;* mid. L. *decĭma*, a tithe—from L. *decem*, ten: mid. L. *decĭmālis*, pertaining to tithes. See Skeat.—SYN. of 'dismal': dull; sorrowful; melancholy; sad; lonesome; doleful; dire, horrid; direful; lamentable; horrible; dolorous; calamitous; unhappy; unfortunate; foreboding; cheerless; uncomfortable.

DISMAL SWAMP, *dĭz′măl swŏmp:* chiefly in Virginia, but partly in N. Carolina; 40 m. long from n. to s., 25 m. wide. In the centre is Lake Drummond, covering about six sq. miles. Elsewhere the surface is divided between tangled reeds and heavy timber, with a thick undergrowth. This extensive morass has been, at a vast cost, traversed by canals, and two lines of railway pass through the outskirts of the Virginian part of the swamp.

DISMANTLE, v. *dĭs-măn′tl* [OF. *desmanteller*, to take a man's cloak from his back—from *des* for L. *dis*, asunder; *manteler*, to cover with a cloak—*lit.*, to throw off a mantle or dress]: to strip or divest, as a house of furniture, or a castle of its defenses. DISMANT′LING, imp. *-măntl′ĭng*: N. the act of stripping or divesting, as a town or fort of its means of defense; operation which a ship undergoes when to be laid up in ordinary, or placed out of service; she is unrigged; the yards and most of the ropes are removed; and the upper masts taken down. DISMAN′TLED, pp. *-măn′tld*.—SYN. of 'dismantle': to divest; strip; disable.

DIS′MAS, SAINT: name which Rom. Cath. tradition has attached to the 'penitent thief.' He is represented with a cross beside him.

DISMAST, v. *dĭs-măst′* [L. *dis*, asunder, and *mast*]: to break down or carry away the masts from a ship. DISMAST′ING, imp. DISMAST′ED, pp.

DISMAY, n. *dĭs-mā′* [Sp. *desmayo*, a fainting fit, dismay: Norm. F. *s'esmayer*, to be sad; *esmay*, sorrow, gloom: It.

smagare, to dispirit: OE. *demaye*]: a loss of courage or firmness; a sinking of the spirits; depression; fear, with discouragement and confusion; terror: V. to terrify and confuse; to dishearten; to discourage or depress. DISMAY'ING, imp. DISMAYED', pp. *-mād'*.—SYN. of 'dismay, v.'; to affright; appall; daunt; discourage; dispirit; deject; fright; frighten; disquiet.

DISME, or DIME, n. *dēm* [F. *dîme;* OF. *disme*—from L. *decĭma*, a tenth part]: tenth; a tenth part; tithe.

DISMEMBER, v. *dĭs-mĕm'bĕr* [OF. *desmembrer*—from *des* for L. *dis*, asunder; *membre*, a limb (see MEMBER)]: to separate limb from limb; to tear or cut in pieces; to maim; to divide; to sever. DISMEM'BERING, imp. DISMEM'BERED, pp. *-bĕrd*. DISMEM'BERMENT, n. the act of severing a limb or limbs from the body; division.—SYN. of 'dismember': to disjoint; dilacerate; dislocate; mutilate; separate; tear.

DISMISS, v. *dĭs-mĭs'* [L. *dis*, asunder; *missus*, sent]: to send away; to permit to depart, used of a person in authority to an inferior—as, the king dismisses the ambassador; to discharge from employment or office. DISMIS'SING, imp. DISMISSED', pp. *-mĭst'*. DISMIS'SAL, n. *-mĭs'săl*, or DISMIS'SION, n. *mĭsh'ŭn*, the act of discharging or sending away; removal from office, etc.

DISMOUNT, v. *dĭs-mownt'* [OF. *desmonter*—from *des* for L. *dis*, away; *monter*, to mount, to ascend (see MOUNT)]: to alight or get off from a horse; to descend or throw down from an elevation; to throw from a horse; to unhorse; to remove cannon, etc., from their carriages. DISMOUNT'ING, imp. DISMOUNT'ED, pp.

DISNATURED, a *dĭs-nāt'tūrd* [L. *dis*, not, and *natured*]: in *OE.*, devoid of natural affection; unnatural.

DISOBEY, v. *dĭs'ō-bā'* [F. *desobéir*—from *des* for L. *dis*, asunder; *obéir*, to obey (see OBEY)]: not to obey; to neglect to do what is commanded; to do what is prohibited; to violate the order or injunction of a superior. DIS'OBEY'ING, imp. DIS'OBEYED', pp. *-bād'*. DISOBEDIENT, a. refusing to obey; not doing what is commanded; doing what is prohibited; refractory. DIS'OBE'DIENTLY, ad. *-lĭ*. DIS'OBE'DIENCE, n. *-dĭ-ĕns*, neglect or refusal to obey; violation of a prohibition or command.

DISOBLIGE, v. *dĭs'ō-blīj'* [L. *dis*, the opposite of, and *oblige:* F. *désobliger*]: to offend by an act of unkindness or incivility; to injure in a slight degree; to contravene the will of another. DIS'OBLI'GING, imp.: ADJ. not disposed to gratify the wishes of another, or to please; unkind. DIS'OBLIGED', pp. *-blījd'*. DIS'OBLIGE'MENT, n. *-mĕnt*. DIS'OBLI'GINGLY, ad. *-lĭ*.

DISORB, v. *dĭs-ŏrb'* [L. *dis*, asunder, and *orbit*]: to throw or fly out of its proper orbit. DISORB'ING, imp. DISORBED, pp. *dĭs-ŏrbd'*.

DISORDER, n. *dĭs-ŏr'dĕr* [OF. *desordre*—from *des* for L. *dis*, asunder; *ordre*, order (see ORDER)]: want of order;

confusion; irregularity; a breach of the peace or laws; a disease either of body or of mind: V. to throw into confusion; to disarrange; to produce sickness; to disturb the mind; to ruffle; to disturb the regular and natural functions of either body or mind. DISOR'DERING, imp. DISOR'DERED, pp. *-dĕrd*, put out of order; sick. DISORDER'LY, a. *-lĭ*, without proper order; confused; irregular; unruly; lawless: AD. confusedly; irregularly. DISOR'DERLINESS, n. *-lĭ-nĕs*.—SYN. of 'disorder, n.': disarrangement; bustle; disturbance; tumult; disease; illness; sickness; malady; distemper; indisposition; disarray;—of 'disorder, v.': to derange; confuse; discompose;—of 'disorderly': unmethodical; confused; inordinate; unruly; intemperate; vicious; loose.

DISOR'DERLY HOUSE: see NUISANCE.

DISORGANIZE, v. *dĭs-ôr'găn-īz'* [L. *dis*, asunder, and *organize:* F. *désorganiser*]: to throw a regular system or union of parts into confusion, as a government, a church, or a society; to destroy order or system. DISOR'GANIZA'TION, n. *-ī-zā'shŭn*, the act of destroying a structure or connected system; state of being disorganized.

DISOWN, v. *dĭs-ōn'* [L. *dis*, not, and *own*]: to refuse to acknowledge as belonging to one's self; to deny; to renounce; not to allow. DISOWN'ING, imp. DISOWNED', pp. *-ōnd'*.—SYN. of 'disown': to disclaim; disavow; disallow; repudiate.

DISPARAGE, v. *dĭs-păr'āj* [Norm. F. *déparager*, to marry a daughter to one of inferior degree—from L. *dispărārĕ*, to part, to separate—from L. *dis*, not; *par*, equal: F. *parage*, equality in birth or in blood, descent—*lit.*, to match one with another of inferior birth and condition]: to undervalue; to injure by comparison with something inferior; to speak slightingly of one; to dishonor or debase by words or actions. DISPAR'AGING, imp. DISPAR'AGED, pp. *-ājd*. DISPAR'AGEMENT, n. injury by comparison with something inferior; a lessening of value or excellence; reproach; detraction; dishonor. DISPAR'AGER, n. *-ă-jĕr*, one who. DISPAR'AGINGLY, ad. *-lĭ*. *Note.*—Skeat cites OF. *desparager*, to offer to a man unworthy conditions, to disparage—from *des* for L. *dis*, asunder; *parage*, lineage, rank—from mid. L. *paratĭcum*, rank.—SYN. of 'disparage': to depreciate; decry; vilify; reproach; degrade; detract from; dishonor; lower; debase;—of 'disparagement': indignity; derogation; detraction; disgrace.

DISPARATE, a. *dĭs'păr-āt* [F. *disparate*, incongruous—from mid. L. *dispărātus*, separated, incongruous—from L. *dis.*, not; *par*, equal]: unlike; dissimilar. DISPARATES, n. plu. *dĭs'pār-āts*, things so unequal or unlike that they cannot be compared.

DISPARITY, n. *dĭs-păr'ĭ-tĭ* [F. *disparité*, incongruity—from L. *dis*, not; *par*, equal]: marked difference in degree, age, rank, condition, or excellence; unlikeness; inequality. —SYN.: disproportion; dissimilitude.

DISPART, v. *dĭs-pârt'* [L. *dis*, asunder, and *part:* F. *départir*, to share, to divide]: to separate; to part asunder; to divide—used in poetry. N. *dĭs'pârt*, in *gunnery*, a mark set upon the muzzle of a gun, to aid the gunner in obtaining a line of sight truly parallel with the axis of the bore. The dispart, in strictness, is not the mark itself, but a distance or quantity denoted by the mark; and 'to dispart' a gun is to determine this distance. It depends on the relation between the diameter of the breech and that of the muzzle; the rule is, the difference between the semi-diameter of the breach and the semi-diameter of the muzzle. DISPART'ING, imp. DISPART'ED, pp.

DISPASSIONATE, a. *dĭs-păsh'ŭn-āt* [L. *dis*, asunder, the opposite of, and *passionate*]: free from passion or personal feeling; cool or collected; not proceeding from temper or bias; impartial. DISPAS'SIONATELY, ad. *-lĭ.*—SYN. of 'dispassionate': unimpassioned; calm; serene; composed; unruffled; temperate; moderate; unbiassed.

DISPATCH, v. *dĭs-păch'* [OF. *despescher;* F. *dépêcher*, to send away quickly, to hasten—from OF. *des* for L. *dis*, apart; *pescher*, to hinder—from L. *pedĭca*, a fetter: comp. OF. *empescher*, to place hindrances in the way: Sp. *despachar*, to expedite—*lit.*, to remove a hindrance]: to send away quickly; to dispose of speedily; to send on special business implying haste; to put to death; to execute speedily; to finish; N. speedy performance; haste; an express message. DISPATCH'ES, n. plu. *-ĕz*, written documents or messages regarding some affair of state sent to or from a country; naval or military reports sent to headquarters. DISPATCH'ING, imp. DISPATCHED', pp. *-spăcht'*. DISPATCH'ER, n. *-ẽr*, one who or that which dispatches.—SYN. of 'dispatch, v.': to hasten; accelerate; expedite; speed; perform; finish; conclude; kill; slay; dispose of; execute;—of 'dispatch, n.': hurry; haste; celerity; promptness; speed; expedition; diligence; a message.

DISPATHY, n. *dĭs'pa-thĭ* [pref. *dis*, and Gr. *pathos*, suffering, feeling]: a want of passion; an absence of sympathy; a point of difference.

DISPEL, v. *dĭs-pĕl'* [L. *dispellĕrĕ*, to drive asunder or scatter—from *dis*, asunder; *pello*, I drive]: to scatter by driving or force; to dissipate; to disperse. DISPEL'LING, imp. DISPELLED', pp. *-pĕld'*.

DISPENSA'TION, in Ecclesiastical Affairs: the remission of a law in a particular case by competent authority. The nature and limits of the dispensing power have been the subject of much discussion not only in controversy with Protestants, but among Roman Catholics themselves. All Rom. Cath. canonists agreed that no human power can grant a dispensation from the natural and moral law. But it is generally held by them that the pope can dispense from vows and oaths, because in that case the obligation is founded on an act of free will, which the pope can annul. Further, with regard to 'positive' divine laws—i.e., with regard to things which are not essentially good or evil, but

which God by special revelation commands or prohibits, the pope may declare that a given case does not come under the law. Of course the pope can dispense from all purely ecclesiastical laws—e.g., the law prohibiting marriage of a man with his deceased wife's sister. Of this kind of dispensation a notable instance in history was the allowance of Henry the Eighth's marriage with Catherine of Aragon, relict of Henry's deceased bro., Arthur. Nothing really of the nature of a formal dispensation is known in any Prot. church. The only kind of dispensations now in use in the Church of England, are those granted by a bishop to a clergyman, to enable him to hold more benefices than one, or to absent himself from his parish. Formerly, the pope's dispensations in England, as elsewhere, prevailed against the law of the land, not in ecclesiastical matters only, but in all that large department of civil affairs, which, by an interested fiction, was brought within the scope of ecclesiastical government. This abuse was swept away at the Reformation, by 25 Henry VIII. c. 21. The power of the pope was then conferred on the abp. of Canterbury, so far as it was not contrary to the law of God. The granting of special licenses of marriage, and the like, is the only form in which it is ever exercised.

Formerly in Eng. the crown claimed a dispensing power in civil, similar to that which belonged to the pope in ecclesiastical matters. The power was grossly abused by James II., and was consequently expressly abolished by the Bill of Rights. The privilege of granting pardons in capital cases is the only form in which the dispensing power of the English crown still exists. In other countries a similar dispensing power vests in the chief executive.

DISPENSE, v. *dĭs-pĕns′* [F. *dispenser*, to distribute—from L. *dispensārĕ*, to weigh out, to distribute, intensive from *dispen′dĕrĕ* for *dispan′dĕrĕ*— from L. *dis*, asunder; *pandĕrĕ*, to spread—*lit.*, to give permission not to do something]: to deal out in parts or portions; to distribute; to administer, as laws; to make up for immediate use, as medicines: N. in *OE.*, exemption. To DISPENSE WITH, to give leave not to do; to do without; to permit the suspension or omission of something usually in force. DISPEN′SING, imp.: ADJ. that gives exemption from; that grants dispensation. DISPENSED′, pp. *-pĕnst′*. DISPEN′SER, n. that which, or one who. DISPEN′SABLE, a. *-să-bl*, that may be dispensed with. DISPEN′SABLENESS, n. DISPEN′SARY, n. *-sĕr-ĭ*, a place where medicines are given to the poor, usually gratis, with medical advice; the place where medicines are prepared. DIS′PENSA′TION, n. *-sā′shŭn* [F.—L.]: exemption from any rule, law, or canon; the liberty granted to a particular person to do what is forbidden; divine government; God's dealings with His creatures; a particular system of principles and rules, as the *Mosaic dispensation;* in *OE.*, a distribution. DISPEN′SATIVE, a. *-să-tĭv*, granting dispensation. DISPEN′SATIVELY, ad. *-lĭ*. DISPEN′SATORY, n. *-tĕr-ĭ*, a book containing the history and composition of medicinal substances, with

information for their preparation as medicines: ADJ. having the power of granting dispensation.

DISPEOPLE, v. *dĭs-pē′pl* [OF. *despeupler*, to dispeople—from *des* for L. *dis*, asunder; *peuple*, people (see PEOPLE)]: to depopulate; to empty of inhabitants.

DISPERMOUS, a. *dī-sper′mŭs* [Gr. *dis*, twice; *sperma*, seed]: in *bot.*, having two seeds.

DISPERSE, v. *dĭs-pĕrs′* [F. *disperser*—from L. *dispersus*, scattered on all sides—from *dis*, asunder; *sparsus*, scattered]: to scatter on all sides; to cause to separate into different parts; to dispel, diffuse, or distribute; to be scattered; to separate. DISPER′SING, imp. DISPERSED′, pp. *-pĕrst′*. DISPER′SER, n. one who. DISPER′SION, n. *-pĕr′shŭn* [F.—L.]: the act of scattering; the state of being scattered; in *optics*, the separation of light into its different colored rays in passing through a prism. DISPER′SEDLY, ad. *-lĭ*. DISPER′SIVE, a. *-sĭv*, tending to separate or scatter. DISPER′SEDNESS, n. state of being dispersed or scattered.—SYN. of 'disperse': to scatter; spread, sprinkle; dissipate; disseminate; vanish.

DISPER′SION, in Optics: prismatic separation of light. Ordinary white light is heterogeneous in character, being composed of rays of different refrangibility, and the term dispersion used to denote the separation of these rays by refraction. Transparent media of various kinds possess different dispersive powers, or, in other words, different powers of widening the angle between the red and violet rays, when a ray of white light suffers refraction through a prism of given angle at a given angle of incidence. What is called the 'irrationality of dispersion,' consists in the fact, that when a spectrum is measured after Frauenhofer's manner, it is found that the distance between any of the same two fixed lines of the spectrum has not a constant ratio to the distance between the extreme fixed lines, where different media are used: see SPECTRUM. The word dispersion is used also sometimes to denote irregular reflection or the scattering of light on imperfectly polished surfaces: see CATOPTRICS. The amount of light not reflected according to the regular law varies with the nature of the reflecting surface. In the case of light incident at right angles upon a surface of common glass, one-thirteenth only is properly reflected. In perpendicular reflection at an ordinary silvered looking-glass, about one-third is lost by this sort of dispersion. A little less than one-third is lost in perpendicular reflection from highly polished speculum metal.

DISPIRIT, v. *dĭs-pĭr′ĭt* [L. *dis*, asunder, and *spirit*]: to discourage; to depress or dishearten. DISPIR′ITING, imp. DISPIR′ITED, pp. DISPIR′ITEDLY, ad. *-lĭ*. DISPIR′ITEDNESS, n. want of courage; depression of spirits.—SYN. of 'dispirit': to depress; damp; deject; cow; daunt; intimidate; terrify.

DISPITEOUS, a. *dĭs-pĭt′ĭ-ŭs* [L. *dis*, asunder, and *piteous*]: in *OE.*, wanting in pity; unpitiful.

DISPLACE, v. *dĭs-plās′* [OF. *desplacer;* F. *déplacer*—from *des* for L. *dis,* asunder; *placer,* to place (see PLACE)]: to put out of the usual order or place; to remove from any state, condition, or office. DISPLA′CING, imp. DISPLACED′, pp. *-plāst′*. DISPLACE′MENT, n. *-plās′mĕnt,* the act of removing from the usual state or condition. DISPLACE′ABLE, a. *-ă-bl,* that may be displaced.—SYN. of 'displace': to derange; disarrange; remove; discard; dismiss; discharge; depose; disorder; disturb.

DISPLANT, v. *dĭs-plănt′* [OF. *desplanter*—from *des,* for L. *dis; planter,* to plant (see PLANT)]: to pluck up or remove a plant; to root out; to remove; to drive out or remove, as the inhabitants of a place.

DISPLAY, v. *dĭs-plā′* [OF. *desployer,* to exhibit, to show—from *des* for L. *dis,* asunder; *ployer,* to fold—from L. *plicārĕ,* to fold: It. *dispiegare,* to extend itself, to explain: comp. Gael. *spleadh,* ostentation, vainglory—*lit.,* to spread out for show]: to spread wide; to open; to expand; to show; to spread before the eyes or mind; to make manifest; to show ostentatiously: N. show; exhibition of anything to the view. DISPLAY′ING, imp. DISPLAYED′, pp. *-plād′*. *Displayed,* in *heraldry,* means expanded; e.g., an eagle displayed is a 'spread eagle' (see EAGLE). DISPLAY′ER, n. one who.—SYN. of 'display, v.': to parade; exhibit; spread out; unfold; discover.

DISPLE, v. *dĭs′pl* [contraction of *discipline,* which see]: in *OE.,* to impose penance; to discipline. DISPLING, imp. *dĭs′plĭng*. DISPLED, pp. *dĭs′pld*.

DISPLEASE, v. *dĭs-plēz′* [OF. *desplaisir*—from *des* for L. *dis,* asunder; *plaisir,* to please (see PLEASE)]: to offend; to make angry in a slight degree; to be disagreeable to; to raise aversion. DISPLEAS′ING, imp.: ADJ. causing displeasure. DISPLEASED′, pp. *-plēzd′*. DISPLEAS′URE, n. *-plĕzh′ûr,* some degree of irritation or uneasiness of the mind caused by something opposed to our desires or commands, or contrary to our sense of right; a slight degree of anger; offense; dislike; state of disfavor.—SYN. of 'displease': to vex; mortify; disgust; anger; chafe; affront; provoke; dissatisfy;—of 'displeasure': disapprobation; distaste; dislike; anger; offense; indignation; annoyance.

DISPLODE, v. *dĭs-plōd′* [L. *displōdĕrĕ,* to spread out, to explode—from *dis,* asunder; *plaudĕrĕ,* to clap, to strike]: in *OE.,* to expand with a loud noise; to discharge, as artillery. DISPLOSION, n. *dĭs-plō′zhŭn* [L. *plōsus,* beaten]: a sudden expansion with loud noise.

DISPONE, v. *dĭs-pōn′* [L. *disponĕrĕ,* to arrange, to dispose—from *dis, pōnō,* I place]: in *Scots law,* to convey or make over to another in a legal form. DISPO′NING, imp. DISPONED′, pp. *-pōnd′*. DISPONEE, n. *dĭs′pō-nē′*, one to whom anything is made over in a legal form. DISPO′NER, n. *-nĕr,* a person who legally transfers property from himself to another.

DISPORT, v. *dĭs-pōrt′* [OF. *desporter,* to amuse one's self—from *des* for L. *dis,* intensive; F. *porter,* L. *portārĕ,* to

carry (see SPORT)]: to sport; to play; to divert or amuse one's self; to move lightly and without restraint: N. play; diversion; amusement. DISPORT'ING, imp. DISPORT'ED, pp.

DISPOSE, v. *dĭs-pōz'* [F. *disposer*, to set in order—from L. *dis*, asunder; *posĭtus*, placed]: to set; to arrange; to place in order; to regulate; to give or apply to a particular purpose; to incline, as the mind; in *OE.*, to conduct; to make terms: N. in *OE.*, disposal; disposition; behavior; inclination. DISPO'SING, imp. DISPOSED', pp. *-pōzd'*. DISPO'SEDNESS, n. *-pō'zĕd-nĕs*, inclination. DISPO'SER, n. *-zẽr*, one who. DISPOSAL, n. *dĭs-pō'zăl*, a setting or arranging; order; arrangement of things; power or right of ordering or bestowing. DISPO'SABLE, a. *-ză-bl*, free to be used or employed as occasion may require. DISPOSITION, n. *dĭs'pō-zĭsh'ŭn* [F.—L.]: act of disposing; state of being disposed; order or manner of arrangement; manner in which things or parts are placed or arranged; order; method; arrangement; temper; natural constitution of the mind; inclination. *Disposition*, in *art*, has reference to the arrangement of the parts, while Composition refers to the effect of the whole: *Disposition*, in *music*, term in organ-building adopted from the German, denoting the arrangement and combination of the stops on the different rows of keys and pedals, with the pitch of each stop, or length of the lowest CC pipe: *Disposition*, in *Scottish law*, deed of conveyance, applicable either to heritable or movable property, most frequently used for the purpose of transferring the former from the seller to the buyer; used also to settle a whole succession, both heritable and movable—known as a disposition and settlement: see INFEFTMENT: TRUST: HERITABLE SECURITIES: MORTGAGE. DIS'POSI'TIONAL, a. *-ŭn-ăl*, pertaining to disposition. To DISPOSE OF, to part with; to sell; to use or employ; to transfer or place by right.—SYN. of 'dispose': to adjust; order; distribute; fit; adapt; give, bestow;—of 'disposal': management; dispensation; disposition; government; conduct; control; regulation; adjustment;—of 'disposition': character; adjustment; disposal; regulation; distribution; adaptation; propensity; tendency; aptitude.

DISPOSSESS, v. *dĭs'pŏs-zĕs'* [L. *dis*, asunder, and *possess*]: to deprive of; to put out of possession by any means. In *law*, to put out of possession, to dislodge and evict; to deprive of actual occupancy, particularly of real property. Dispossess *proceedings* are begun against a tenant who is then served with a dispossess *warrant*, and ejectment from the premises follows. See EJECTMENT. DIS'POSSES'SING, imp. DIS'POSSESSED', pp. *-zĕst'*. DISPOSSES'SION, n. *-zĕsh'ŭn*, act of putting out of possession.

DISPRAISE, v. *dĭs-prāz'* [OF. *despreisier* and *desprisier*—from *des* for L. *dis*, asunder; *preisier* and *prisier*, to praise (see PRAISE)]: to mention with some degree of reproach or disapproval; to censure. N. blame; censure; dishonor. DISPRAIS'ING, imp. DISPRAISED', pp. *-prāzd'*. DISPRAIS'ER, n. one who. DISPRAIS'INGLY, ad. *-lĭ*.

DISPROOF, n. *dĭs-prôf'* [L. *dis*, the opposite of, and *proof*]: a proving to be false or erroneous; confutation.

DISPROPORTION, n. *dĭs'prō-pōr'shŭn* [F. *disproportion*—from L. *dis*, the opposite of, and *proportion*]: a want of due relation of parts of one thing to another, or between the parts of a thing; want of symmetry; want of proper quantity; unsuitableness of things or parts to each other; inequality; disparity: V. to unite things unsuitable; to mismatch. DIS'PROPOR'TIONABLE, a. *-ă-bl*, not in proportion; unsuitable in form, size, or quantity to something else. DIS'PROPOR'TIONABLENESS, n. *-bl-nĕs*, the want of symmetry; the state of being unsuitable. DIS'PROPOR'TIONABLY, ad. *-ă-blĭ*. DIS'PROPOR'TIONAL, a. *-ăl*, not having a due relation or proportion to something else. DIS'PROPOR'TIONALLY, ad. *-ăl-lĭ*. DIS'PROPOR'TIONATE, a. *-āt*, not proportioned; unsuitable to something else in bulk, form, or value. DIS'PROPOR'TIONATELY, ad. *-lĭ*. DIS'PROPOR'TIONATENESS, n. *-nĕs*, the state of being disproportionate.

DISPROVE, v. *dĭs-prôv'* [L. *dis*, the opposite of, and *prove*]: to prove to be false or erroneous; to confute. DISPRO'VING, imp. DISPROVED', pp. *-prôvd'*. DISPRO'VABLE, a. *-vă-bl*, capable of being disproved. DISPRO'VAL, n. *-văl*, act of disproving. DISPRO'VER, n. one who.

DISPUTE, v. *dĭs-pūt'* [F. *disputer*, to dispute; *dispute*, a dispute or quarrel—from L. *disputārĕ*, to cast up a sum, to examine and discuss a subject—from *dis*, asunder; *puto*, I think: It. *disputare—lit.*, to examine and discuss a subject, and so make it clear]: to debate; to contend for by words or actions; to reason or argue in opposition to; to altercate; to doubt or question: N. a debate; a contest by words; a controversy; an altercation. DISPU'TING, imp. DISPU'TED, pp. DISPUTABLE, a. *dĭs'pū-tă-bl* [F.—L.]: liable to be called in question or controverted. DIS'PUTABLY, ad. *-blĭ*. DIS'PUTABLENESS, n. *-bl-nĕs*. DISPUTANT, n. *dĭs'pū-tănt* [F.]: one who argues or disputes. DIS'PUTA'TION, n. *-tā'-shŭn*, a controversy; a contest in words. DIS'PUTA'TIOUS, or DISPU'TATIVE, a. disposed to debate, argue or dispute. —SYN. of 'dispute, v.': to argue; impugn; question; doubt; contest; controvert; quarrel; disagree; differ.

DISQUALIFY, v. *dĭs-kwŏl'ĭ-fī* [L. *dis*, asunder, and *qualify*]: to render unfit; to deprive of natural power, properties, or qualities necessary for any work or place; to reject, as in an examination. DISQUAL'IFYING, imp. DISQUAL'IFIED, pp. *-fīd*, rendered unfit. DISQUAL'IFICA'TION, n. *-fĭ-kā'shŭn*, act of disqualifying; that which rejects.

DISQUIET, v. *dĭs-kwī'ĕt* [L. *dis*, not, and *quiet*]: to disturb; to make uneasy or restless in mind or body: N. uneasiness; restlessness; anxiety. DISQUI'ETNESS, n., or DISQUI'ETUDE, n. *-ĕ-tūd*, uneasiness; want of tranquillity. DISQUI'ETING, imp. DISQUI'ETED, pp. DISQUI'ETLY, ad. *-ĕt-lĭ*.

DISQUISITION, n. *dĭs'kwĭ-zĭsh'ŭn* [F. *disquisition*—from L. *disquisitĭōnem*, a judicial inquiry—from *dis*, asunder; *quæsītus*, sought: It. *disquisizione*]: a formal inquiry into any subject by argument or discussion; a dissertation. DIS'QUISI'TIONAL, a. pertaining to.

DISRAELI, *dĭz-rā′le*, or *dĭz-rā′ĕl-e*, BENJAMIN, Earl of BEACONSFIELD: author and statesman: 1804, Dec. 21—1881, Apr. 19; b. at 6 John Street, Bedford Row, London; and a week later, circumcised after the Hebrew rite. He was educated partly at a private school, kept at Walthamstow by a Unitarian minister; received baptism in the Anglican Church 1817; and was articled to a solicitor 1821, in order to qualify him for a government office. He was admitted a student at Lincoln's Inn 1824, and kept nine terms, but had his name removed from the books 1831. Abandoning the study of law, he developed an ambition to shine in political and fashionable life. In 1826, he published his novel *Vivian Grey*, succeeded at intervals by other brilliant works of fiction, including *The Young Duke*, *Contarini Fleming*, *The Wondrous Tale of Alroy*, and *Henrietta Temple*. He wrote also *The Rise of Iskander*, *A Vindication of the British Constitution*, and *The Revolutionary Epic*. After visiting Italy, Greece, Turkey, and Syria, he returned to England, to find the country involved in the reform bill agitation. His sympathies appear to have then inclined to radicalism in politics; and having obtained recommendations from Mr. Hume and Mr. O'Connell, he presented himself 1832 to the electors of Wycombe, but was defeated. At the general election 1835, he had no better success. In April in the same year, he contested Taunton on conservative principles, again without success. In 1837, his desire for a political career being unabated, he contested Maidstone in the conservative interest with Mr. Wyndham Lewis. He was elected, and at the age of 32 took his seat in the house of commons. His maiden speech, which was in a high-flown style, and delivered with extravagant gestures, excited the laughter of the house of commons. He was so much disconcerted, that he stopped short abruptly, but not without uttering the remarkable prophecy: 'I shall sit down now, but the time will come when you will hear me.' In 1838, Mr. W. Lewis died, and in the following year Disraeli married the widow of his late colleague. He then carefully studied the style of successful parliamentary orators, making few speeches. It was not till 1840 that he began to attract notice, and not long afterward he gained the ear of the house as the leader of the Young England party. After entering parliament, Disraeli wrote several novels.—*Coningsby* (1844), *Sybil* (1845), *Tancred* (1847), in which the principles of young England are most ingeniously blended with theories about the intellectual supremacy of the Jews, inaccurate scientific notions, and misconceptions of English social life. At the general election, 1841, he obtained a seat for Shrewsbury. He then became the organ of the dissatisfaction with which the landed aristocracy and country gentry regarded Sir Robert Peel's relaxations of the system of protection to native industry. His brilliant invective and polished sarcasm inspired the protectionist party with fallacious hope and confidence. On the death of Lord George Bentinck 1848, Disraeli succeeded to the leadership of the protec-

tionist party in the commons. He bore generous testimony to the political consistency and private worth of his predecessor in his *Lord George Bentinck, a Biography.* In 1852, the Earl of Derby, having undertaken the construction of a cabinet, offered him the post of chancellor of the exchequer. It was the first time a brilliant novelist had ever figured as the finance minister of a great commercial state, and it shows the versatility of his genius that he emerged with honor and credit from the ordeal. His second budget, 1853, failed, however, to find acceptance with the house of commons, and the government being outvoted upon it, the Derby cabinet ceased to exist. Disraeli resumed the leadership of the opposition, from which he was again summoned 1858, to the post of chancellor of the exchequer in the second administration of Lord Derby. In 1859, he introduced a measure of parliamentary reform, which, being thrown out, was followed by the resignation of the government. For seven years the liberals remained in power, and Disraeli, in opposition, displayed talents as a debater, and a spirit and persistency under defeat, which won the admiration of his opponents. When Lord Derby returned to power 1866, July, Disraeli again returned to the post of chancellor of the exchequer. It was he chiefly who induced the conservative party to pass the reform bill of 1867, his argument being, that the working-class householders are more conservative than those to whom the franchise had been previously extended. In 1868, Feb., Disraeli succeeded Lord Derby as premier, but, in the face of a hostile majority, he resigned in Dec. following. On this occasion, Mrs. Disraeli, in acknowledgment of her husband's services, was raised to the peerage as Viscountess Beaconsfield (died 1872), Disraeli then declining the honor in his own case. In 1870, Disraeli published another novel, *Lothair,* marked by most of the merits and defects of those which preceded it. In 1873 the popularity of Mr. Gladstone subsided, and the election of 1874 giving the conservatives a large majority, Disraeli returned to power as prime-minister. In 1877 Disraeli took his seat in the upper house as Earl of Beaconsfield. Still premier, the earl was the guiding spirit of his cabinet during the critical years 1877–8, seeking by energetic action in eastern affairs to give an 'imperial' character to English policy; and he returned from the congress of Berlin bringing, as he said, 'peace with honor.' He was shortly thereafter decorated with the Garter. After a keen contest, in which the liberal leaders, headed by Mr. Gladstone, vigorously denounced government measures, especially in regard to the affairs of eastern Europe, Afghanistan, and s. Africa, the general election returned a large liberal majority; and the government resigned ere parliament assembled. The ex-premier, who held several honorary degrees as D.C.L. and LL.D., employed his leisure in publishing his last novel, *Endymion,* the hero of which is a successful English politician. The Earl of Beaconsfield took his share in public affairs as a member of the upper house till final illness in the spring of

1881. The terms of his will alone precluded the honor of a public funeral and burial in Westminster Abbey, proposed by the government. See Hitchman, *The Public Life of Beaconsfield*, by Brandes (transl. 1880); the (hostile) *Life* by O'Connor (1878); Selected Speeches, edited by Kebbel (1882).

DISRAELI, Isaac, D.C.L.: English author: 1766–1848; b. Enfield; descendant of a Hebrew family whose home was first in Spain, afterward in Italy. He was son of Benjamin D'Israeli, who came to England 1748, entered into business in London, amassed a fortune while in middle life, and retiring to Enfield, died 1817, aged 90. Isaac was educated at Amsterdam and Leyden, and began his career as poet and novelist; but, after the publication of the first vol. of his *Curiosities of Literature* (1791), he discovered that his forte lay not in creative literature, but in the illustration of history and literary character. His style is elegant and pleasing, presenting the fruits of antiquarian research and study without their dryness and general want of connection. No writer is more instructively amusing or amusingly instructive than he. Lord Byron speaks of him as 'that most entertaining and searching writer.' Disraeli's principal works are the *Curiosities of Literature* (1791–1823; new ed. with Life, Lond. 1851); *A Dissertation on Anecdotes* (1793); *Essay on the Manners and Genius of the Literary Character* (1795, 14th ed. 1850); *Inquiry into the Literary and Political Character of King James I.* (1816); *Commentaries on the Life and Reign of Charles I.* (1828–31); *Eliot, Hampden, and Pym* (1832); *Amenities of Literature* (1841)—for which he received from Oxford the degrees D.C.L.

DISREGARD, v. *dĭs'rĕ-gârd'* [L. *dis*, not, and *regard*]: to neglect to take notice of; to omit to observe; to slight: N. neglect implying indifference or some degree of contempt Dis'regard'ing, imp. Dis'regard'ed, pp. Dis'regard'er, n. one who. Dis'regard'ful, a. *-fûl*, neglectful; heedless.

DISRELISH, n. *dĭs-rĕl'ĭsh* [L. *dis*, not, and *relish*]: distaste or dislike; a slight degree of disgust: V. to dislike the taste of; to feel disgust at, as conduct or speech.

DISREPAIR, n. *dĭs'rĕ-pär'* [L. *dis*, not, and *repair*]: state of being out of repair or in bad condition.

DISREPUTE, n. *dĭs'rĕ-pūt'* [L. *dis*, asunder, and *repute*]: loss or want of repute; ill character; discredit; dishonor. Disreputable, a. *dĭs-rĕp'ū-tă-bl*, low; mean; dishonorable; disgraceful. Disrep'utably, ad. *-blĭ*, discreditably.

DISRESPECT, n. *dĭs'rĕ-spĕkt'* [L. *dis*, not, and *respect*]: want of respect; incivility; disesteem: V. to show or feel disrespect to. Dis'respect'ful, a. *-fûl*, uncivil; wanting in respect. Dis'respect'fully, ad. *-lĭ*.

DISROBE, v. *dĭs-rōb'* [L. *dis*, the opposite of, and *robe*]: to undress; to strip; to divest of covering. Disro'bing, imp. Disrobed', pp. *-rōbd'*. Disro'ber, n. *-bĕr*, one who.

DISRUPT, v. *dĭs-rŭpt′* [L. *disruptus*, burst asunder—from *dis*, asunder; *ruptus*, broken]: to burst or rend in pieces; to separate. DISRUP′TING, imp. DISRUP′TED, pp. ADJ. in *geol.*, applied to igneous matter that has forced its way through stratified rocks, and filled up the rents and fissures so made. DISRUP′TION, n. *-rŭp′shŭn* [F.—L.]: the act of rending asunder; breach; rent. THE DISRUPTION, the great split or division in the Church of Scotland, 1843, by which more than 400 ministers of the Church of Scotland (nearly two-fifths of the whole) left their churches and manses to vindicate principles which they deemed essential to the purity of that church, and in harmony with its earlier history. The word Disruption was chosen probably to indicate that these ministers did not look on their act as a *secession* or *dissent* from the Church of Scotland, but as a *split* or *division* within it, and the body formed by them assumed the name of the Free Church of Scotland: its practical effect, however, was a secession or dissent from the established church: see FREE CHURCH.

DISSATISFY, v. *dĭs-săt′ĭs-fī* [L. *dis*, the opposite of, and *satisfy*]: to fail to please; to give discontent to; to cause uneasiness to. DISSAT′ISFYING, imp. DISSAT′ISFIED, pp. *-fīd:* ADJ. discontented; not pleased. DISSAT′ISFAC′TION, n. *-făk′shŭn*, discontent; want of satisfaction. DISSAT′ISFAC′TORY, a. *-făk′tĕr-ĭ*, causing discontent; displeasing; unable to give content. DISSAT′ISFAC′TORINESS, n. inability to give content.—SYN. of 'dissatisfaction': displeasure; disapprobation; annoyance; discontentment; distaste; dislike.

DISSEAT, v. *dĭs-sēt′* [L. *dis*, asunder, and *seat*]: in *OE.*, to deprive of a seat; to unseat.

DISSECT, v. *dĭs-sĕkt′* [L. *dissectus*, cut asunder—from *dis*, asunder; *sectus*, cut]: to cut or divide a body in order to examine minutely its structure; to cut in pieces; to anatomize. DISSEC′TING, imp. DISSEC′TED, pp. DISSEC′TOR, one who dissects; an anatomist. DISSEC′TIBLE, a. *-sĕk′tĭ-bl*, that can bear dissection. DISSEC′TION, n. *-shŭn* [F.—L.]: the act of cutting or separating the parts of a body for examination of its structure; a prepared specimen of dissected parts: see ANATOMY, in Law. DISSECTION WOUNDS, cuts, punctures, or abrasions, of the operator's skin in the act of dissection. The dangers in the practical study of anatomy have been much lessened during the last quarter of a century. The atmosphere of the dissecting-room, now comparatively pure by the application of proper ventilation and other sanitary measures, was, less than a generation ago, usually loaded with noxious emanations, tending to poison the blood of those who continuously inhaled it, and consequently produced nausea, sickness, diarrhoea, bad taste in the mouth, and other symptoms. Dissection wounds, always attended with some risk, were rendered more dangerous by the low state of the system, induced by the depressing influence of the surrounding air. Now, probably in consequence

partly of the purer air, and partly of the general and extensive use of antiseptic injections into the vessels of the subjects to be dissected, it rarely happens that severe symptoms follow a cut or puncture; it being an established rule, that every puncture should be carefully sucked as soon as observed, and then freely touched with nitrate of silver. When, however, the poison has been absorbed, and is going to act, the patient begins to have a feeling of general illness in less than 24 hours. He is low-spirited, faint, chilly, and often complains of nausea. Then come rigors, intense headache, rapid and sharp (but weak) pulse, a coated tongue, vomiting (sometimes), and great restlessness.

The general symptoms increase in severity, the breathing becoming difficult, the pulse very rapid and weaker, the tongue dry, brown and often tremulous when protruded, and the skin more or less yellow. The case may terminate fatally at or before this stage; or abscesses may continue to form, from which the patient may more slowly sink; or if he survive, the arm may remain stiff and useless, or some of the fingers may be destroyed by gangrene. The treatment, both general and local, is similar to that of pyæmia (q.v.): see also Poisons.

As a precautionary measure in post-mortem examinations, the surgeon, especially if out of health, or if the patient have died from a disease of erysipelatous character, should thoroughly anoint his hands with lard. Very thin india-rubber gloves have been recommended as a safeguard to dissectors; but they have not been found serviceable; probably from the constraint to which they subject the action of the fingers.

DISSEIZE, or Disseise, v. *dĭs-sēz′* [L. *dis*, asunder, and *seize*, which see: Norm. F. *dissaiser*—from mid. L. *dis-seisĭārĕ*, to thrust out from possession of property]: in *law*, to dispossess wrongfully; to deprive of seizin or possession. Disseiz′ing, imp. Disseized′, pp. *-sēzd′*. Disseiz′in, n. *-sēz′ĭn*, an unlawful dispossessing of a person of his lands or tenements. Disseiz′or, n. one who puts another out of possession wrongfully. Disseiz′ee, n. *dĭs′sēz-ē′*, a person put out of possession unlawfully.

DISSEMBLE, v. *dĭs-sĕm′bl* [OF. *dissembler*, not to be alike—from *dis*, apart; *sembler*, to seem: L. *dissimŭlārĕ*, to disguise, to hide—from *dis*, not; *simĭlĭs*, like]: to act the hypocrite; to hide under a false appearance; to disguise under the appearance of truth; to simulate. Dissem′bling, imp.: Adj. disguising; dishonest: N. dissimulation. Dissem′bled, pp. *-bld*. Dissem′bler, n. one who. Dissem′blingly, ad. *-lĭ*.—Syn. of 'dissemble': to disguise; conceal; cloak; cover; mask; feign; assume.

DISSEMINATE, v. *dĭs-sĕm′ĭ-nāt* [L. *dissemĭnātus*, scattered, as seeds—from *dis*, asunder; *sēmen*, seed: It. *disseminare:* F. *disséminer*]: to spread or scatter like seed; to propagate; to circulate; to diffuse. Dissem′inating, imp. Dissem′inated, pp. Dissem′inator, n. one who. Dis-

SEM′INA′TION, n. *-nā′shŭn* [F.—L.]: the act of spreading or propagating. DISSEM′INA′TIVE, a. *-nā′tĭv*, tending to disseminate.—SYN. of 'disseminate': to spread; diffuse; disperse; scatter.

DISSENT, n. *dĭs-sĕnt′* [L. *dissen′tiĕns* or *dissentĭĕn′tem*, disagreeing—from *dissentīrĕ*, to disagree—from *dis*, asunder; *sentĭō*, I think: It. *dissentire*]: difference of opinion; disagreement; difference in opinion from the Established Church in matters of government or doctrine; separation from Established Church; nonconformity: V. to disagree in opinion; to think differently; to differ in opinion and separate from the Established Church in matters of doctrine or government. DISSEN′TING, imp.: ADJ. having the character of dissent or belonging to it. DISSEN′TED, pp. DISSEN′TER, n. one who differs from the Established Church in doctrine or government; a nonconformist; one who separates from the communion of an Established Church. DISSEN′TIENT, a. *-sĕn′shĭ-ĕnt*, disagreeing: N. one who disagrees and declares his dissent, DISSEN′SION, n. *-shŭn* [F.—L.]: disagreement in opinion; strife; contention in words; discord. DISSEN′TIOUS, a. *-shŭs*, or DISSEN′SIOUS, a. *-shŭs*, disposed to discord; quarrelsome. *Note.*—In quite early times, *dissent* in doctrine from a national church was called *heresy*, and *dissent* in discipline and practical order, *schism;* these terms and their distinctive applications are still in good use.—SYN. of 'dissent, n.': variance; difference; nonconformity; separation; diversity.

DISSEN′TERS: common appellation of those who dissent or differ from the established church of their country in any of its authoritative doctrines, or in any part of its constitution, and therefore separate themselves from it. Although sometimes employed as a sufficiently appropriate designation of the sects which separated themselves from the general body of the church during the early and middle ages, the term dissenters belongs to modern times and Protestant countries; the claims of the Rom. Cath. Church, where dominant, having always been asserted in a manner incompatible with the existence of legally recognized religious dissent. The measure in which the rights of dissenters are conceded by law, may be esteemed a fair test of religious liberty in a country, and of the general enlightenment of a people—according to the low standard of religious liberty which is in vogue where one sect is exclusively established as a national church. The term dissenters is of English origin and growth, though its almost exact equivalent may be said to have existed in Poland in the name *Dissidents*, used in 1573 to denote the Polish Protestants, in distinction from the adherents of the established Rom. Cath. religion. After 1632, the term Dissidents was applied in Poland to Lutherans, Greeks, Armenians, etc.

In England, the term dissenters appears to have come into use in the 17th c., as synonymous with *Nonconformists;* and from England its use was transferred to Scotland in the 18th c., after the Secession (q.v.) Church had been

founded in that country. It is usually applied to those who agree with the established church in the most essential doctrines, but differ from it on some minor point, or on questions of church government, relation to the state, rights, etc., as in England to Presbyterians, Congregationalists, and Baptists. The claim of the Church of Rome to be regarded as the *Catholic* Church prevents its members from accepting the name of dissenters, and others, in courtesy, seldom seek to apply it to them. On somewhat similar grounds, it is rejected by *Episcopalians* in Scotland, and its application to them is not usually urged by others; and for very different reasons, elsewhere explained, the *Methodist* (q.v.) churches are seldom included in it, as ordinarily used. Since the beginning of the 18th c., the Presbyterian, Congregationalist, and Baptist denominations in England, have been associated under the name of the *Three Denominations*. See ESTABLISHED CHURCH: NONCONFORMISTS: PURITANS: TOLERATION, etc.

The term dissenters is not strictly legal or ecclesiastical, those to whom it applies being usually described in legal language by a periphrasis. It is a convenient term to designate those Protestant denominations which have dissented from the doctrine and practice of the church as by law established. Immediately after the Reformation in England, Episcopacy being established by law, dissenters, or nonconformists as then called, were subjected to severe restrictions and penalties. 'During the Rebellion, the laws against Protestant sectaries were repealed; but they revived at the Restoration; and the parliament of Charles II. proceeded to enforce systematically, by new measures of vigor, the principle of universal conformity to the established church. In 1690, the restrictions on dissenters were first relaxed, and certain denominations were suffered to exercise their own religious observances. From that period, various statutes have been passed, each extending in some degree the free exercise of religious opinion. At the present time, dissenters of all denominations are allowed to practice without restraint their own system of religious worship and discipline, They are entitled to their own places of worship, and to maintain schools for instruction in their own opinions. They are permitted also, in their character as householders, to sit and vote in the parish vestries. A dissenter, if a patron of a church, may also exercise his own judgment in appointing a clergyman of the Church of England to a vacant living. (See Stephen's *Eccles. Law.*)

In Scotland, where Presbyterianism is established by law, a similar amount of religious liberty obtains, not so much derived from or guarded by special statute, but fully recognized by decisions of courts, as belonging to the law of the land.

DISSEPIMENT, n. *dĭs-sĕp'ĭ-mĕnt* [L. *dissepīrĕ*, to separate—from *dis*, asunder; *sēpēs*, a hedge, a fence]: a partition: in *botany*, the partition between two carpels (q.v.) in an ovary or fruit composed of a number of carpels. A dis-

sepiment is formed by the union of the sides of two carpels. Sometimes dissepiments meet in the centre or axis, completely dividing the ovary or fruit into cells; sometimes they are partial, appearing as mere projections from the outer walls of the ovary or fruit, and leaving it one-celled. Many ovaries and fruits exhibit partitions not formed by the union of the sides of carpels; these are sometimes called *spurious dissepiments*. Dissepiment is applied also to a partition in a coral.

DISSERTATION, n. *dĭs'sẽr-tā'shŭn* [F. *dissertation*—from L. *dissertātĭōnem*, a dissertation or discourse—from *disserto*, I argue or debate a thing]: a formal discourse written on any subject; a treatise; a disquisition. DISSERTA'TIONAL, a. *-shŭn-ăl*, pertaining to.

DISSERVE, v. *dĭs-sẽrv'* [L. *dis*, asunder, and *serve*]: to injure; to hurt or harm. DISSERVICE, n. *dĭs-sẽr'vĭs*, injury; harm. DISSER'VICEABLE, *-ă-bl*, injurious; hurtful. DISSER'VICEABLENESS, n. *-bl-nĕs*, injury; mischief.

DISSEVER, v. *dĭs-sĕv'ẽr* [OF. *dessevrer*—from *des* for L. *dis*, intensive; *sevrer*, to sever (see SEVER)]: to part in two; to divide or tear asunder; to separate. DISSEV'ERING, imp. DISSEV'ERED, pp. *-ẽrd*. DISSEV'ERANCE, n. *-ẽr-ăns*, separation; the act of dissevering; also DISSEV'ERA'TION, n. *-ā'shŭn*.

DISSIDENT, a. *dĭs'sĭ-dĕnt* [F. *dissident*—from L. *dissĭdens* or *dissĭden'tem*, being at variance—from *dis*, asunder; *sĕdĕō*, I sit]: not agreeing; discordant: N. a dissenter; one who votes or gives his opinions about any point in opposition to others. DIS'SIDENTLY, ad. *-lĭ*. DIS'SIDENCE n. *-dĕns* [F.—L.]: discord; disagreement. DIS'SIDENTS, n. plu. a name applied on the continent of Europe to adherents of the Lutheran, the Calvinistic, and the Greek churches: see DISSENTERS.

DISSILIENT, a. *dĭs-sĭl'ĭ-ĕnt* [L. *dissĭlĭĕns* or *dissilĭĕn'tem*, leaping asunder, flying apart—from *dis*, asunder; *sălĭĕns*, leaping]: starting asunder; in *bot.*, applied to seed vessels which burst and open with an elastic force. DISSIL'IENCE, n. *-ĕns*, act of leaping or starting asunder.

DISSIMILAR, a. *dĭs-sĭm'ĭ-lẽr* [F. *dissimilaire*—from L. *dissim'ĭlis*, unlike—from *dis*, not; *simĭlis*, like: It. *disimile*]: unlike; not similar. DISSIM'ILAR'ITY, n. *-lăr'ĭ-tĭ*, unlikeness; want of resemblance. DISSIM'ILARLY, ad. *-lẽr-lĭ* DIS'SIMIL'ITUDE, n. *-sĭ-mĭl'ĭ-tūd* [L. *dis*, and *similitude*]: want of resemblance; a comparison by contrast.

DISSIMULATION, n. *dĭs-sĭm'ū-lā'shŭn* [F. *dissimulation*—from L. *dissimŭlātĭōnem*, a dissembling, a concealing—from *dis*, intensive; *simŭlo*, I feign]: false pretension; a concealing of something; a hiding under a false appearance; a feigning; hypocrisy.

DISSIPATE, v. *dĭs'sĭ-pāt* [L. *dissĭpātus*, scattered, dispersed: It. *dissipare:* F. *dissiper*]: to scatter completely; to dissolve and disappear; to vanish; to expend; to squander; to consume. DIS'SIPATING, imp. DIS'SIPATED, pp.: ADJ.

debauched; dissolute. DIS′SIPA′TION, n. *-pā′shŭn* [F.—L.]: the act of scattering completely; the insensible diminution of a body; an irregular, extravagant course of life; dissoluteness.—SYN. of 'dissipate': to disperse; scatter; waste; dispel; spend; lavish.

DISSOCIATE, v. *dĭs-sō′shĭ-āt* [L. *dissŏcĭātus*, separated from fellowship—from L. *dis*, asunder; *socĭō*, I unite]: to separate from fellowship; to disunite; to part. DISSO′CIATING, imp. DISSO′CIATED, pp. DISSO′CIA′TION, n. *ā′shŭn*, sometimes *disassociation*, the act of disuniting or separating. DISSO′CIABLE, a. *-ă-bl*, not well united or assorted; that cannot be brought to fellowship. DISSO′CIABIL′ITY, n. *-bĭl′ĭ-tĭ*.

DISSOCIATION, in Chemistry: is the resolution of a substance into other substances, whose molecules have a simpler constitution; but the word is usually applied only to those reversible resolutions in which the secondary products are capable of recombining to form the primitive substance, when the conditions that led to the dissociation are removed or reversed. Dissociation is therefore to be contrasted with 'decomposition,' for the latter word is used without any implication as to the subsequent behavior of the products into which the primitive substance is resolved. Dissociation, in the usual sense of the word, is induced directly by the application of heat.

DISSOCIATION, in Psychology: has assumed importance recently because of its application in the explanation of mental disease. In essential it consists in a breaking or dissolving of the bonds of association between elements or wider portions of mind. Specific or general memories disappear, and in the more developed cases there are profound disturbances or divisions of the personality. Janet asserts that the disturbances of all kinds in hysteria are due fundamentally to dissociation. The dissociation may be induced in those predisposed through nervous weakness, by physical or mental shock, or by the accumulation of the toxines of various diseases in the blood.

DISSOLUBLE, DISSOLUBILITY: see under DISSOLVE.

DISSOLUTE, a. *dĭs′sō-lôt* [L. *dissŏlūtŭs*, loose, reckless—from *dis*, asunder; *solūtŭs*, loosed, unbound: It. *dissoluto:* F. *dissolu*]: given to vice and dissipation; loose in behavior; profligate. DIS′SOLUTELY, ad. *-lĭ*. DIS′SOLUTENESS, n. looseness; laxity of manners; debauchery.

DISSOLVE, v. *dĭz-zŏlv′* [L. *dissolvĕrĕ*, to separate, to dissolve—from *dis*, asunder; *solvo*, I loose: It. *dissolvere*]: to become disseminated through a liquid, said of a solid, as sugar in water; to break up; to separate; to destroy; to consume or waste away; to be broken; to come to an end. DISSOL′VING, imp. DISSOLVED′, pp. *-zŏlvd′*. DISSOL′VENT, a. *-vĕnt*, having power to dissolve: N. any substance which has the power of dissolving a solid body. DISSOL′VER, n. that which dissolves; a vessel for dissolving in. DISSOL′VABLE, a. *-vă-bl*, capable of being dissolved; that

may be converted into a fluid. DISSOL'VABLENESS, n. *bl-nĕss*, the quality of being dissolvable. DISSOLVING VIEWS, pictures painted upon glass and made to appear of great size and with great distinctness upon a wall by means of a magic lantern with strong lenses and an intense oxyhydrogen light, and then—by removal of the glass from the focus, and gradual increase of its distance—apparently dissolved into a haze, through which a second picture is made to appear by means of a second slide (sometimes by a second magic-lantern), at first with a feeble, afterward with a strong light. DIS'SOLU'TION, n. *-lo͞o'shŭn* [F.—L.]: the act of dissolving or liquefying; the separation of the parts of a body; by putrefaction, etc.; separation of the soul from the body; death; the breaking up of an assembly or partnership. DIS'SOLUBLE, a. *-sŏl-ū-bl* [F.—L.]: that may have its parts separated by heat or moisture; that may be disunited. DIS'SOLUBIL'ITY, n. *-ŭ-bĭl'ĭ-tĭ*, capacity of being dissolved by heat or moisture. DISSOLUTION OF MARRIAGE: see DIVORCE.—SYN. of 'dissolute': disorderly; licentious; wanton; wild; vicious; uncurbed; debauched; luxurious; lax; lewd; rakish; unrestrained; abandoned.

DISSONANT, a. *dĭs'sō-nănt* [F. *dissonant*—from L. *dissonans* or *dissonan'tem*, disagreeing in sound—from *dis*, asunder; *sŏnans*, sounding: It. *dissonante*]: discordant; inharmonious; unpleasant to the ear; harsh; disagreeing. DIS'SONANCE, n. *-năns* [F.—L.]: a discord; any sound harsh or unpleasant to the ear. In *music*, dissonance is the opposite of consonance, and denotes those intervals in music whose relative proportions are to a certain extent unsatisfactory to the ear, and produce a degree of disquietude. In a special sense, the term dissonance is applied to the interval causing the unpleasant effect; which sound is not always, as some think, the upper note, but may be the middle or the lowest note. Many believe that the feeling of dissatisfaction produced by the dissonances of music arises from the mind not being able without difficulty to comprehend at once the arithmetical proportions of the vibrations. The foundation of dissonance, however, is generally allowed to be more æsthetical than intellectual, as through the vibrations of a sounding body the air is put into a similar state of vibration, which is communicated to our ear, and so to our whole nervous system, through which we obtain the inward feeling representing the sound. In music, dissonance may be called a necessary æsthetical evil, which is used in the finest musical works for the purpose of producing pleasant contrasts, with their resolutions. In modern music, dissonance is divided into *essential* and *accidental;* the former arising fundamentally, the latter arising from passing notes, anticipations, suspensions, etc. see HARMONY.

DISSUADE, v. *dĭs-swad'* [F. *dissuader*—from L. *dissuādērĕ*, to oppose by argument—from *dis*, asunder; *suād'ō*, I advise or incite; *suāsus*, advised, incited: It. *dissuader*]: to advise or exhort against; to attempt to draw from a measure or purpose by reasoning or motives.

DISSUA'DING imp. DISSUA'DED, pp. advised against; induced not to do something. DISSUA'DER, n. one who. DISSUA'SION, n. *-swā'zhŭn* [F.—L.]: advice against something. DISSUA'SIVE, a. *-zĭv*, tending to dissuade: N. argument or counsel employed to deter from a measure or purpose. DISSUA'SIVELY, ad. *-lĭ*.

DISSYLLABLE, n. *dĭs-sĭl'lă-bl* [OF. *dissyllabe*, of two syllables—from L. *disyllabus*—from Gr. *dis*, twice; *syllăbē*, a syllable]: a word of two syllables. DIS'SYLLAB'IC, a. *lăb'ĭk*, consisting of two syllables. DIS'SYLLABICA'TION, n. *-lăb-ĭ-kā'shŭn*, or DIS'SYLLAB'IFICA'TION, n. *-fĭ-kā'shŭn* [L. *facĭō*, I make]: act of forming into two syllables.

DIS'TAFF, the earliest instrument of spinning, a staff, on one end of which the wool or flax was rolled. The spinner held it in the left hand, and drew out the fibres with the right, at the same time twisting them. A spindle was attached to the thread, the weight of which carried down the thread as it was spun. When the spindle reached the ground the thread which was wound round it was then again fastened near the beginning of the new thread. The 7th of January is called St. Distaff's Day, because it marks the return of the women to their usual household duties, after the revels of Twelfth Day.

DISTAFF THISTLE: *Carthamus alatus.*

DISTAIN, v. *dĭs-tān'* [OF. *desteindre;* F. *déteindre*, to discolor—from L. *dis*, asunder; *tingĕrĕ*, to dye]: to stain; to discolor; to blot; to defile. DISTAIN'ING, imp. DISTAINED', pp. *-tānd'*.

DISTAL, a. *dĭs'tăl* [a probable corruption of *distant*]: in *anat.*, remote from the place of attachment, as the *distal* extremity of a bone—the opposite or *proximal* end being that nearer the attachment of the limb to the trunk.

DISTANCE, n. *dĭs'tăns* [F. *distance*—from L. *distantĭă*, remoteness—from *dis*, asunder; *stans*, standing: It. *distanzia*]: the interval or space between two objects, events, or periods; remoteness; any particular or undefined length of time; reserve; coldness; an interval in music; in *art*, that portion of a picture where the visual rays meet; the limit of view in a picture, or *point* of *distance*, as it is called in perspective; the *middle distance* being the central portion between the extreme distance and the foreground. The art of producing on the eye the effect of real distance, so far as it is not accomplished by mere mechanical rules, is one of the most subtle branches of landscape-painting, and cannot be acquired otherwise than by long experience and a careful study of the effects of light and shade. See PERSPECTIVE. DISTANCE, v. to place remotely; to leave behind in a race. DIS'TANCING, imp. DIS'TANCED, pp. *-tănst*, left so far behind as to be out of a race; outstripped. DIS'TANT, a. *-tănt* [F.—L.]: separate; standing apart; remote in time, place, connection, etc.; remote in view; reserved; cold; somewhat haughty. DIS'TANTLY, ad. *-lĭ*. TO KEEP ONE'S DISTANCE, to have no intercourse with; to stand

aloof.—Syn. of 'distant': far; faint; slight; indistinct; indirect; shy; reserved; obscure; repugnant.

DISTASTE, n. *dĭs-tāst'* [L. *dis*, asunder, and *taste*]: dislike of food or drink; dislike of anything; a slight degree of disgust; disrelish. Distaste'ful, a. *-fûl*, offensive; nauseous; unpleasant to the taste. Distaste'fully, ad. *-lĭ*. Distaste'fulness, n. the quality of being distasteful; dislike.—Syn. of 'distaste, n.': disgust; dislike; aversion; disinclination; displeasure; dissatisfaction; discomfort; loathing; offense; nausea.

DISTEMPER, n. *dĭs-tĕm'pėr* [OF. *destemprer*, to derange, to disorder—from *des* for L. *dis*, asunder; F. *temprer*, to qualify, to temper—from L. *temperārĕ*, to mingle in due proportion—*lit.*, that which is not mingled in due proportions, as the humors of the body]: the diseased state of an animal; disease; malady; a morbid state of mind; a disease in dogs, beginning with a running from the nose and eyes: V. to disorder; to derange body or mind. Distem'pering, imp.: Adj. disordering. Distem'pered, pp. *-pėrd:* Adj. diseased; disordered; out of temper.—Syn. of 'distemper, n.': sickness; complaint; ailment; disorder; illness; indisposition.

DISTEMPER, n. *dĭs-tĕm'pėr* [OF. *destemprer*, to soak in water—from *des* for L. *dis*, intensive, and *temprer*, to steep, to dip—from L. *distemperārĕ*, to temper steel, to mix: It. *distemperare*, to dissolve any liquor or fluid; *tempera*, water-colors (see Distemper 1)]: in *painting*, the preparation of colors with size and water, or gum-water; coarse mode of painting, in which the colors—inferior to those usual with artists—are mixed in a watery glue, such as size and whiting. The chief purposes for which distemper is now used are scene-painting and staining papers for walls. But the old masters frequently executed pictures and portions of pictures in distemper, and then oiled them, by which means they acquired the character of being painted originally in oil. It is said that Paul Veronese sometimes began his pictures in distemper, and finished them in oil, and that he frequently painted his skies in distemper. Distemper is often ignorantly supposed to be identical with fresco (q.v.). The difference is, that while in the former the colors are laid on a dry surface, in the latter they are put on wet mortar or plaster. See Gelatine. Distemper, v. to mix colors with size and water, etc. To paint in distemper, to paint with colors mixed with size or gum-water instead of oil, and on a dry surface: see Tempera.

DISTEM'PER, in dogs: typhoid inflammation affecting the upper air-passages of young dogs. Like scarlatina and similar diseases of children, it is generally contagious, occurs only once in a lifetime, runs a definite course, is accompanied by low fever and debility, and is most successfully treated by good nursing and attention to diet and regimen. The eyes are red, weak, and watery; the nose dry and hot; draughts of air or movements of the animal readily excite sneezing or cough; there is dulness,

fever, and loss of appetite. The thickened slimy mucus which the inflamed membrane, after some days, secretes, accumulates about the eyes and nostrils, and lodging in the bronchial tubes, prevents the free access of air, and the proper purification of the blood. Hence ensue distressed breathing, increasing weakness, and symptoms of nervous disturbance, such as staggering gait, chorea (q.v.), and fits. All dogs are liable to distemper; but the delicate, highly bred, and artificially treated varieties suffer most severely, and among them the mortality is very great. Bleeding, physicking, and all irritating and reducing remedies, must be carefully avoided, and a good dry bed in a comfortable airy place provided. The stomach, which is generally overloaded, should be relieved of its contents by an emetic, which, for an ordinary sized English terrier, may consist of two grains each of tartar emetic and ipecacuanha, with eight or ten grains of common salt, given in a wine-glass of tepid water. If no effect is produced, the dose must be repeated in 20 minutes. Constipation, if present, should be corrected by half an ounce each of castor and olive oil, to which, in large dogs, a few grains of gray powder is a useful addition. The febrile symptoms, if acute, may be alleviated by giving four times daily, in cold water, two drops of tincture of aconite, and five grains each of nitre and extract of belladonna. Distressed breathing will be relieved by applying to the chest and sides, for an hour or two continuously, a thick flannel cloth, wrung at short intervals out of hot water. The throat may also be rubbed with hartshorn and oil, and the nostrils sponged and steamed occasionally. Give frequently, and in small quantities at a time, milk and bread, or any other such simple and digestible food, and when recovery is tardy, and weakness ensues, endeavor by nursing, tonics (q.v.), and stimulants (q.v.) to support the strength.

The term distemper is sometimes applied to influenza in horses, and epizootic pleuro-penumonia (q.v.) in cattle.

Distemper in Horses, often called *Strangles*, is a contagious disease occurring principally in colts and young horses, and seldom appearing after the eighth year. It is characterized by debility and loss of appetite, and accompanied by cough, inflamed appearance of the nasal membranes, red and watery eyes, and thin discharge from the nose, constipation, scanty and high-colored urine, thirst and general feverish condition of the system. A swelling appears between the bones of the lower jaw which usually results in an abscess. When this discharges relief is immediate, and if well fed and properly cared for the subject soon recovers. This form of the disease runs its course in from ten days to several months. Sometimes the swelling hardens and matter is deposited in the lungs or in other internal organs. Many cases of this form prove fatal. *Causes:* change of food, exposure to cold and storms, impure air, contagion, and change of climate. *Treatment:* medicine is seldom required. Separate the animal from

other horses, give soft, nourishing food, keep in a warm, well-ventilated stable, poultice the swelling, and open the abscess when it comes to a head. In severe attacks give stimulants and tonics to keep up the strength, and relieve constipation by injection of warm water. See INFLUENZA.

DISTEMPERATURE, n. *dĭs-tĕm′pĕr-ă-tūr* [L. *dis*, asunder, and *temperature*]: excess of heat or cold, or of other qualities; perturbation of mind; confusion; indisposition; in *OE.*, perturbation of the mind; disorder; sickness; confusion.

DISTEND, v. *dĭs-tĕnd′* [F. *distendre*—from L. *disten′-dĕrĕ*, to stretch asunder—from *dis*, asunder; *tendo*, I stretch; *tensus* or *tentus*, stretched: It. *distendere*]: to stretch or spread in all directions; to enlarge or expand; to swell. DISTEND′ING, imp. DISTEND′ED, pp.: ADJ. stretched out in different directions. DISTEN′TION, or DISTEN′SION, n. *-tĕn′shŭn* [F. *distension;* L. *distentĭōnem*]: the state of things stretched or swelled; the act of swelling or enlarging; the space occupied by the thing distended. DISTEN′SIBLE, a. *-sĭ-bl*, capable of being distended or dilated. DISTENT, a. *dĭs-tĕnt′* [L. *dis*, *tensus* or *tentus*, stretched out]: in *OE.*, distended.—SYN. of 'distend': to dilate; extend; stretch; inflate.

DISTICH, n. *dĭs′tĭk* [L. *distĭchus*, consisting of two rows: Gr. *distĭchon*, a couplet—from Gr. *dis*, twice; *stichos*, a row, a verse]: classical term for any two poetic lines, especially a hexameter and a pentameter, making complete sense; a couplet. It was much used by the Greeks and Romans for the expression of single thoughts and sentiments; hence it became almost exclusively employed for the classical epigram. The great poets of modern Germany, also have shown a fondness for the distich, and remarkable skill in the use of it. A collection of moral maxims in Latin ascribed to a certain Cato, Dionysius (q.v.), are called *Disticha*, and were highly popular during the middle ages. DIS′TICHOUS, a. *-ŭs*, disposed in two rows on the opposite sides of a stem or axis, as the grains in an ear of barley.

DISTICHIACEÆ, n. plu. *dĭs-tĭk-ĭ-ā′se-ē* [Gr. *distichia*, a double line—from *dis*, twice; *stichos*, a row, order, or line]: family of operculate acrocarpous, i.e., terminal fruited, mosses, of cespitose habit, and fruit consisting of oval, equal capsules. DISTICH′IUM, n. genus of mosses, type of the family *Distichiaceæ*.

DISTIL, v. *dĭs-tĭl′* [F. *distiller*, to distil—from L. *dis-tillāre* for *destillārĕ*, to drip or trickle down—from *de*, down; *stillo*, I drop—*lit.*, to drip or trickle down in drops]: to vaporize by heat and then reconvert into the liquid state; to separate a more volatile part, as spirit or essential oil, from a substance by vaporizing and then cooling the vapor; to let fall in drops; to flow gently. DISTIL′LING, imp.: N. the act or process of extracting spirit by heat. DISTILLED′, pp. *-tĭld′:* ADJ. extracted by heat or by dropping. DIS-TIL′LER, n. one who distils. DISTIL′LABLE, a. *-lă-bl*, capable of being distilled. DIS′TILLATE, n. *-lāt* [L. *dis-*

tillātus, distilled]: the product resulting from distillation DIS'TILLA'TION, n. *-lā'shŭn* [F.—L.]: the manufacture of ardent spirits or alcoholic liquors from grains, etc.; the operation of extracting a spirit from any substance by evaporation by heat, and subsequent condensation. DISTIL'LATORY, a. *-tĕr-ĭ*, pertaining to distillation. DISTIL'LERY, n. *-lĕr-ĭ*, the buildings and works where distilling is carried on. DISTIL'MENT, n. in *OE.*, the thing let fall softly and insidiously by drops. FRACTIONAL DISTILLATION, a process of distilling in which the distillate is removed after every small rise of temperature.

DISTILLATION: term applied to the conversion of a substance into vapor by heating, and the condensation of this vapor to a liquid by cooling it in another part of the apparatus. If the vapor condenses to a solid the process is termed *sublimation*, whereas, when the vapor is not cooled and collected, but is allowed to escape into the atmosphere the operation is called *evaporation*. Destructive distillation, occasionally incorrectly called dry distillation, is applied to the process of decomposing a substance by heat in the absence of air, the decomposition products being usually condensed or collected, as for example, in the making of illuminating gas and tar by heating coal. A distillation apparatus consists essentially of three parts; (1) the vessel in which the substance is heated, often termed the 'retort,' or still; (2) the arrangement for cooling the vapor, this is called the condenser. On a large scale these often consist of coils of pipe, cooled by air or by water. Such condensers are called from their shape 'worms.' (3) A vessel for the collection of the distilled products; this is referred to as a receiver. The substance remaining in the retort after distillation is called the residue, and the portion which passes over is the distillate. When the distillate is collected in several portions, which have passed over between different limits of temperature, the operation is described as *fractional distillation*. By repeating this process a number of times with each individual portion of the distillate, it is often possible to separate the constituents of a very complex mixture. Thus, crude petroleum, when distilled, has no constant boiling point, the portions which pass over between definite limits of temperature, say up to 50°, 50°–100°, 100°–150° c.n.c. are collected separately. Each of these is again distilled in the same manner and, finally, such products as benzine, gasoline, kerosene, naphtha, etc., are obtained. Each of these is a mixture of several chemical compounds which can usually be isolated by repeating the fractionation a large number of times. Many substances decompose below their boiling points, but the latter are lowered if the atmospheric pressure is reduced, in this manner it is sometimes possible to bring the boiling point down below the decomposing temperature. Distillation under these conditions is referred to as *distillation in vacuum* or 'under reduced pressure.' In the Arts, distillation is chiefly used in the petroleum and coal tar industries, and in the manu-

facture of spirits, i.e., in the separation of alcohol from water. See ALCOHOL; FERMENTATION. Also in the turpentine and wood tar industries. Fractional distillation is greatly assisted by the use of a dephlegmator or rectifier. These are of many forms, the simplest consists of an upright tube placed between the still and the condenser. Part of the vapor passes over and is, of course, collected in the receiver in the ordinary manner, but a portion of it is condensed near the sides of the tube and runs back into the still, the ascending column of vapor is washed by this condensed material and so the separation of the less from the more volatile constituents is greatly facilitated. In order to secure a more intimate contact between the vapor and liquid the tube may be filled with glass beads, platinum gauze, or other suitable material having a relatively large surface. Dephlegmators constructed on this principle, but of course on a very much larger scale, are quite often used in technical distillation, in these appliances the beads, etc., are of course dispensed with their place being taken by various mechanical devices to secure an intimate contact between the heated vapor and the portion which has condensed first.

DISTILLED′ WATER: condensed product obtained by the distillation of water. All natural waters, even rain-water, contain certain saline matters (common salt, etc.) in a state of solution, from which they can be completely freed only by the process of distillation. The characters of distilled water are, that it possesses a mawkish, insipid taste, without odor or color, and when evaporated to dryness in a vessel, it ought to leave no residue. For the other properties of distilled water, see WATER.

DISTILLED WATERS: term denoting the product obtained by distilling water with the parts of plants containing essential oils. Rose-water and lavender-water are familiar examples.

DISTINCT, a. *dĭs-tĭngkt′* [F. *distinct*—from L. *distinctus*, separated, marked off: It. *distinto*]: not the same in number or kind; separate; clear; different; plain; obvious; not confused; in *OE.*, variegated; spotted. DISTINCT′LY, ad. *-lĭ*, not confusedly; clearly; plainly. DISTINCT′NESS, n. clearness; precision. DISTINC′TION, n. *-tĭngk′shŭn* [F.—L.]: a difference by which one thing is known from another; separation into parts; division; mark of difference or superiority; elevation of rank or character; eminence. DISTINC′TIVE, a. *-tĭv*, that marks distinction or difference; well-marked; specific. DISTINC′TIVELY, ad. *-lĭ*. DISTINC′TIVENESS, n. state of being distinctive.—SYN. of 'distinct': precise; different; marked; variegated; individual; well-defined;—of 'distinction': difference; variety; variation; contrast; diversity; contrariety; discrimination; preference, superiority; rank; note; separation.

DISTINGUISH, v. *dĭs-tĭng′gwish* [OF. *distinguer*—from L. *distinguĕrĕ*, to mark a difference—from *dis*, asunder; *stinguo*, I scratch out: It. *distinguere*]: to indicate difference

by some external mark; to separate or divide by some mark or quality; to perceive a difference by the senses; to make eminent or known; to signalize; to characterize; to find the difference. DISTIN'GUISHING, imp.: ADJ. constituting distinction or difference from other things. DISTIN'GUISHED, pp. *gwĭsht:* ADJ. separated from others by some marked difference; conspicuous; celebrated; illustrious; eminent. DISTIN'GUISHABLE, a. *gwĭsh-ă-bl*, that may be known by some mark of difference; worthy of special regard. DISTIN'GUISHABLENESS, n. *-bl-nĕs*. DISTIN'GUISHABLY, ad. *-ă-blĭ*. DISTIN'GUISHER, n. one who or that which. DISTIN'GUISHINGLY, ad. *-lĭ*. DISTIN'GUISHMENT, n. distinction; observation or difference.—SYN. of 'distinguish': to discriminate; mark; honor; discern; perceive; recognize; separate;—of 'distinguished': prominent; marked; noted; famous; conspicuous; transcendent.

DISTOMA: see FLUKE.

DISTOMIDÆ: see TREMATODA.

DISTORT, v. *dĭs-tôrt'* [L. *distortus*, distorted, deformed—from *dis*, asunder; *tortus*, twisted: It. *distorto:* F. *distors*]: to twist out of a natural or regular shape; to put out of its natural posture; to wrest from the true meaning; to pervert. DISTORT'ING, imp. DISTORT'ED, pp. DISTOR'TION, n. *-tôr'shŭn* [F.—L.]: the act of twisting or wresting out of a natural shape; some visible deformity, as a curved spine, squinting, etc.; a perversion of the true meaning of words. *Distortion*, in *perspective*, failure of the image formed by a lens on the focusing screen of a camera obscura to fulfil the conditions imposed by the rules of perspective in the delineation of natural objects. The effect of distortion is to render curvilinear all straight lines that do not pass through the centre of the lens, and also to alter the relative proportions of objects in the picture so as to violate the principles of perspective. Distortion, in the camera obscura, is usually produced by the eccentrical incidence of the oblique pencils.—SYN. of 'distort': to twist; twirl; wrest; deform; bend.

DISTORTION OF THE MAGNETIC FIELD. See ELECTRICAL MACHINES.

DISTRACT, v. *dĭs-trăkt'* [L. *distractus*, divided, perplexed—from *dis*, asunder; *tractus*, drawn or dragged]: to pull the attention or mind in different directions; to confuse; to perplex; to confound or harass; to derange or unsettle; to make mad; to turn or draw from any point or object. DISTRAC'TING, imp. DISTRAC'TED, pp.: ADJ. disordered in mind; furious; mad. DISTRAC'TION, n. *-trăk' shŭn* [F.—L.]: confusion from a crowding of objects on the mind; perplexity; perturbation; madness. DISTRAC'TEDLY, ad. *-lĭ*. DISTRAC'TEDNESS, n. state of being distracted. DISTRAC'TIVE, a. *-tĭv*, causing perplexity. DISTRAC'TILE, a. *-tĭl*, in *bot.*, applied to a connective that divides into two portions so that the anther-cells are far asunder, one being often absent: ADJ. separating two parts to a distance from each other.—SYN. of 'distraction': derangement; raving;

fury; furiousness; franticness; disorder; dissension; tumult; disturbance; embarrassment; agitation.

DISTRAIN, v. *dĭs-trān′* [OF. *distraindre*—from mid. L. *distringĕrĕ*, to exercise severity upon, to compel or constrain a person to do something by the exaction of a pledge or by a fine—from L. *dis*, asunder; *stringo*, I strain, I draw tight]: to seize the person or goods for debt or rent; to make seizure. DISTRAIN′ING, imp. DISTRAINED′, pp. *-trānd′*. DISTRAIN′ABLE, a. *-ă-bl*, liable to be distrained. DISTRAINT′, n. *-trānt′*, a seizing of goods for rent, etc. DISTRAIN′OR, n. *-trān′er*, he who seizes goods for debt or for service.

DISTRAIT, a. *dĭs-trāt′* [F. *distrait*, distracted]: absent-minded; lost in thought: see DISTRAUGHT.

DISTRAUGHT, pp. of v. *dĭs-trawt′* [L. *distractus*, pulled in different directions, dragged: F. *distract*, distracted]: reduced to a state of perplexity and distraction; perplexed; confounded; made mad. *Note.*—DISTRAUGHT is usually accepted as the pt. and pp. of *distract*, as *taught* of *teach*. It is rather a word of independent formation, and an example of an AS. termination, *ght*, engrafted on a Latin stem.

DISTREIN′: see DISTRESS.

DISTRESS, n. *dĭs-trĕs′* [F. *détresse*, misery, affliction: OF. *destrece*, oppression: mid. L. *districtĭō*, the judicial exaction of a fine or pledge, the pledge or fine exacted, subsequently termed a *distress;* connected with *distrain*]: extreme pain of body; anguish of mind; calamity; adversity; misfortune; poverty; destitution; a state of danger; the act of taking goods for rent, etc.: V. to afflict with pain; to pain; to grieve; to make miserable. DISTRES′SING, imp.: ADJ. afflicting; oppressing with pain of mind or body. DISTRESSED′, pp. *-trĕst.* DISTRESS′FUL, a. *-fûl*, bringing or inflicting distress; calamitous; proceeding from pain or anguish. DISTRESS′FULLY, ad. *-lĭ.*—SYN. of 'distress, n.': affliction; suffering; pain; trouble; grief; sorrow; agony; misery; want; anguish; harassment; perplexity.

DISTRESS, in Law: remedy provided to enforce the payment of rent, taxes, and other duties, to exact compensation from owners for damages resulting from the trespasses of their cattle, and to compel the appearance at court of a party who could not be found by other processes. The action, known also as *distrain*, consists in taking property belonging to another as a pledge and keeping it till the obligation which it is intended to enforce is performed. The remedy is a very ancient one, and is believed to have prevailed among the Gothic nations of Europe from the dissolution of the Roman Empire. It has been on the statute books of England since the days of Magna Charta, and was thence introduced into the American colonies. In the United States its operations have been almost wholly confined to the collection of rents. Experience has shown that it is too harsh a remedy as far as the debtor is

concerned, and that it discriminates in favor of the landlord and against other creditors. As a result it has been totally abolished in many states, and materially modified in the few that still retain it. In some states, like those of New England, it has been superseded by the law of attachment on *mesne* process (see ATTACHMENT, in Law), and in some southern states, while there are no statutory provisions on the subject, landlords have a lien otherwise on growing crops. The more general mode of procedure for the collection of rent, for which writs of distress were mainly obtained, is by means of a chattel mortgage given the landlord by the tenant, a demand on the sureties who, in some states, sign a lease with the tenant guaranteeing payment of rent should the tenant fail to do so, or the various actions authorized by the laws relating to landlords and tenants adopted by the different states. See DEBTS, RECOVERY OF.

DISTRIBUTE, v. *dĭs-trĭb′ūt* [L. *distribūtus*, distributed —from *dis*, asunder; *tribŭō*, I give or divide: It. *distribuire:* F. *distribuer*]: to divide among two or more; to deal out; to dispense or administer; to separate into classes or orders. DISTRIB′UTING, imp. DISTRIB′UTED, pp. divided among a number; bestowed; in *logic*, applied to a term used in its full extent. DISTRIB′UTABLE, a. *-ū-tă-bl*, that may be distributed. DISTRIBUTION, n. *dĭs′trĭ-bū′shŭn* [F.—L.]: the act of dividing among a number; a giving in parts or portions; a separation or division into parts or classes. DISTRIB′-UTIVE, a. *-trĭb′ū-tĭv*, that divides or assigns in portions: N. in *gram.*, a word containing the idea of distribution, as *each, one by one*, etc. DISTRIB′-UTIVELY, ad. *-ū-tĭv-lĭ*.—SYN. of 'distribute': to disperse; apportion; allot; assign; divide; share; administer; dispose.

DISTRIBUTION, in political economy, the apportioning of the products of industry among the people concerned. The methods of distribution have varied and do vary in accordance with the state of social development. They depend on legal as well as on economic conditions. They depend mainly on the ideas and institutions which prevail with reference to property in the three requisites of production—namely, land, labor, and capital. In countries where slavery prevailed, the slaveholder, as the owner alike of land, labor, and capital, disposed at his pleasure of the entire product of industry. Under the feudal system, the cultivator who was attached to the soil and had a fixed interest in it, was to render to his superiors dues in labor, in kind, and latterly in money, which were fixed by custom or authority. Where the system prevails of cultivators owning the soil, as in America, and among the peasant proprietors of the European continent, the owner, inasmuch as he unites in his own person land, labor, and capital disposes of the entire product, except such portion as may be claimed by the money-lender. In cases where the state owns the land, the cultivator pays a rent or tax to the government, and retains the remainder. The *metayer* system still exists in Italy, the owner advancing the land and stock (in whole or in part), and receiving from the

cultivator a fixed share of the produce, generally one half. In countries with a highly developed industry, land, labor, and capital are supplied respectively by three different classes of persons, and their share in the produce is determined by free competition. The classical political economy of England may be defined as a description and analysis of such an economic condition of society. It claims to be a science only in so far as the competitive system prevails. The landlord's share in the produce thus determined is called rent; that of the capitalist and employer is designated as interest, profit, earnings of management, etc.; the laborers' share is wages. It should be pointed out that under such a system the central function in distribution, as well as in production, rests with the employer. As he originates and controls the productive process, so in the distributive process he settles with landlord and laborer, and then disposes of the produce. If the employer operates in whole or in part with borrowed capital, interest on that capital must also be deducted from his share of the produce. All these claims satisfied, the amount of his share will depend on his success in disposing of the product. It is now admitted that economists have bestowed excessive attention on production, to the neglect of the problem of distribution. But the reproach has a much wider application than to economists merely, for it may generally be said that while modern communities have enormously increased their productive forces, they have not yet solved the problem of distribution. The enormous inequalities of distribution are a danger felt by all thinking men. It is a question which is more and more challenging the attention of statesmen and economists. An economic system can be satisfactory only when a high standard of production finds its complement in a reasonable and equitable distribution, supplying to the mass of the citizens the means for their due physical, intellectual, and moral development. For a special method of seeking to secure the equitable distribution of profits among those who earn them, see CO-OPERATION.

DISTRIBUTION OF SPECIES: see GEOGRAPHICAL DISTRIBUTION OF PLANTS AND ANIMALS.

DISTRIBUTION OF TERMS: *in logic*, when a term is taken in its entire extent or universally it is said to be distributed; when not so taken it is undistributed. The sign of distribution is 'All,' e. g., 'All A is B'; 'Some' is the sign of non-distribution, e. g., 'Some A is B.' The universal affirmative, 'All A is B,' distributes its subject only; the universal negative 'No A is B,' distributes both subject and predicate; the particular negative 'Some A is not B,' distributes its predicate only; the particular affirmative, 'Some A is B,' distributes neither subject nor predicate. A clear grasp of the rules of distribution is the key to the understanding of the rules of the *syllogism* (q. v.).

DISTRIBUTIONS, STATUTE OF: laws providing for a division by order of an authorized court of the residue of the personal estate, after the payment of debts and charges.

of a person dying intestate. The death of the owner vests the title to real estate in his or her heirs, and that to personal estate in the executor or administrator, from whom it reaches the beneficiaries through the process of distribution. The term distribution is also employed to denote the division of a residue of both real and personal property as well as the division of an estate according to the terms of a will. The manner of the distribution is governed by the law of the decedent's domicile. In Ala., Ark., Cal., Colo., Conn., Dak., Fla., Ga., Ill., Ind., Io., Kan., La., Mich., Minn., Miss., Mo., Mont., Neb., Nev., N. H., N. Mex., O., Penn., S. C., Tex., Utah. Vt., Wash., Wyo., and substantially in Ky., Me., and Wis., the statute rules are essentially the same as those for the descent of real estate, both where no distinction between ancestral and non-ancestral real estate is made, and where such distinction of non-ancestral real estate is made. In Ariz., Del., D. C., Ida., Md., Mass., N. J., N. Y., Or., R. I., Tenn., Va., and W. Va., the rules differ from the above as well as from each other, are very explicit, and quite voluminous.

DISTRICT, n. *dĭs'trĭkt* [F. *district;* OF. *destroict*—from mid. L. *districtum,* the right of exercising judicial authority, or the territory over which it was exercised—from *dis,* asunder; *strictus,* drawn together]: a limited extent of country; a part of a country or city defined by law or agreement; a part of a country not defined, as the iron districts. —Syn.: tract, region; quarter; division; province; country.

DISTRICT, Congressional: a division of a state according to its population, sufficient in size to entitle it to a representative in congress. The ratio of representation is established by congress every ten years, and is based on the total population as reported by the last preceding census. This is in accordance with the provisions of the U. S. constitution (art. 1, sec 2), which further declares that the number of representatives shall not exceed one for every 30,000, and, lest some state might have less than the required population, that each state shall have at least one representative. The number of inhabitants required to constitute a Congressional District, under the census of 1880 was 151,911, and the total number of districts in the U. S. was 325; under the census of 1890 the ratio of representation was 173,901, and the number of districts 356; under the census of 1900 the ratio of representation was 194,182, and the number of districts 386. The action of the federal govt. ceases with the fixing of the rate, and each state establishes the boundaries of its own districts by an act of its legislature. There is, therefore, a decennial change in the number and frequently in the boundaries of the districts.

DISTRICT, State Senatorial: a division of a state according to its population, sufficient in size to entitle it to a representative in the upper house of its legislature. The boundaries are fixed by the legislature, each on a different basis of representation, but with the view of establishing an equality in such representation; and are subject to change

by the same authority whenever the increase of population goes beyond the fixed ratio, or whenever the dominant political party deems it advantageous in order to secure an increased number of representatives, particularly when the election of a U. S. senator is about devolving upon the legislature. See GERRYMANDER.

DISTRICT ATTORNEY of THE UNITED STATES: lawyer commissioned by the president to act as attorney for the government in the various circuit and district courts of the country. His duty is to prosecute in his own district all delinquents for crimes and offenses cognizable under the authority of the United States, and all civil actions in which the United States shall be concerned, except in the supreme court. Should proceedings be taken against any local federal officer, such as a collector or other officer of the revenue service, for an action growing out of his official duty, the District Attorney will appear for such defendant, unless the secretary of the treasury selects other counsel. He reports the general business of his office to the attorney-general of the United States, and on instituting any suit for the recovery of any fine, penalty, or forfeiture, is required to transmit immediately a statement of the case to the solicitor of the treasury, to whom he also forwards at the close of every term of court a particular statement of all cases decided therein in which the United States is concerned.

DISTRICT COURTS OF THE UNITED STATES: those ranking between the circuit and the territorial courts. The United States was divided (1903) into 83 federal judicial districts, to each of which a judge is appointed by the pres., except in some cases otherwise specially provided for. The judge must be a resident of the district to which he is appointed, and the records must be kept in the place where the court is held. The districts are variously constituted: Colo., Conn., Del., Hawaii, Idaho, Ind., Kan., Ky., Me., Md., Mass., Minn., Miss., Mont., Neb., Nev., N. H., N. J., N. D., Or., R. I., S. C., S. D., Vt., Wash., W. Va., and Wyo. have one district court each; Ala., Ark., Cal., Fla., Ga., Ill., Io., La., Mich., Mo., N. C., Tenn., Va., and Wis. have two; Alaska, Ohio, and Penn., three; and Ind. Terr., New York, and Texas, four. The judges are appointed for four years.

The jurisdiction of District courts is regulated by act of congress and varies at different times; but in general the questions of which they take cognizance are: Exclusive jurisdiction of all admiralty and maritime cases, such as seizures on land or navigable waters, salvage, prizes, etc., and also actions against consuls or vice-consuls; all suits brought by aliens for violation of law of nations or of treaty of U. S.; all offenses cognizable by the U. S. where the punishment is not capital; piracy when no circuit court is in the district; penalties and forfeitures under U. S. law; all common law suits brought by or against the U. S.; all cases arising under postal, patent, or copyright laws. Questions of fact, except in maritime cases, are decided by a jury.

DISTRICT OF COLUMBIA: federal district of the United States of America, containing the seat of the general government; bounded on the n., n.w., e., and s.e. by Md., and w. and s.w. by Va., from which it is separated by the Potomac river; 105 m. on air line and 200 m. by water w. of the Atlantic Ocean; area, 64 sq. m. The river was named the 'River of Swans' by the Indian tribes who early dwelt along its shores, and the vicinity is believed to have been explored first by William Fleet, an Indian trader, who is known to have had business relations with Leonard Calvert about 1634. In or near 1660, an Englishman named Pope acquired a considerable tract of land here, and undertook to establish himself on a magnificent scale. He named the tract Rome; a stream then running through it and now the site of a portion of Penn. ave., the Tiber; and the most elevated spot, where the Capitol now stands, Capitoline Hill; and then, in furtherance of his fancy, signed all his letters and documents, of which he issued many, 'the Pope of Rome.' The exigencies of the Revolutionary period rendered it impossible for congress to have a settled seat, and its sessions were held at various times, and under more or less threatening conditions, in Philadelphia, Baltimore, Lancaster, York, Princeton, Annapolis, Trenton, and New York. In 1783, June 21, while congress was sitting in Philadelphia, a body of disaffected militia made a threatening demonstration against the delegates, which resulted in breaking up the session. When the congress reassembled, one of its first acts was to resolve, 1783, Oct. 7, that a building for its use should be erected at some place near the falls of the Delaware. This resolution aroused a sectional jealousy, and it was amended so as to provide for two meeting places, one near the falls of the Potomac, in which alternate sessions could be held. After a long debate the original resolution was adopted, and commissioners were appointed to lay out a federal town. A report was submitted by the commissioners, but owing to a lack of funds no steps were taken under it.

The question of a permanent seat of federal authority was one of the most annoying ones with which the framers of the constitution had to deal. Sectional and political considerations and compromise measures were urged with much vigor and at times with alarming threats. At length a clause (17) was inserted in Art. I., sec. 8, conceding to the congress the right 'to exercise exclusive legislation in all cases whatsoever, over such district (not exceeding 10 miles square) as may, by cession of particular states, and the acceptance of congress, become the seat of the government of the United States.' The controversy over the location then became fiercer than before. Strong objections were raised against New York, Philadelphia, a proposed site on the banks of the Susquehanna river, and other locations. Southern delegates insisted on a southern location, and northern delegates on a northern; and a proposition in compromise was made providing for a federal seat in each section and alternate sessions. The situation was further complicated by the proposition of Alexander Hamilton

that the federal govt. should assume the state debts, and his opposition to a location farther s. than Philadelphia. Through the efforts of Thomas Jefferson congress passed an act, 1790, June 28, containing the clause 'That a district of territory on the river Potomac, at some place between the mouths of the Eastern Branch and the Connogocheague, be and the same is hereby accepted for the permanent seat of the government of the United States.' In the same act congress decided to meet in Philadelphia till the first Monday in Nov., 1800, and then remove to its new home on the Potomac. On the adoption of this act, the state of Md. ceded a tract of 60 sq. m. on one side of the river, and the state of Va. a tract of 40 sq. m. on the other. Under an act of 1791, Mar. 30, this district was laid out by George Washington in person, and the first stone to mark its boundaries was set at Jones's Point, below Alexandria, 1791, Apr. 15. There was a wide difference of opinion as to a name for the place. For a few months it was officially known as 'The Federal City,' and 1791, Sep. 9, the three commissioners appointed by the president decided to call the district 'The Territory of Columbia,' and the city 'The City of Washington.' Owing to inadequate appropriations by congress, the preparation of suitable quarters for congress to meet in at the time designated would have failed had it not been for a loan of $100,000 by the legislature of Md. to the commissioners personally. Under the direction of Maj. L'Enfant, a French engineer to whom Washington had become much attached, the city was laid out, public buildings erected, and congress took possession at the appointed time. Subsequently the whole federal territory was officially named 'The District of Columbia,' and in 1846, the cession of 40 sq. m. by Va. was retroceded, leaving the area as at present.

Prior to 1871 the legislative power was exercised directly by congress, and the citizens had no representation in congress, nor a vote in district or national affairs. During 1871–74 the district was under the form of govt. provided for the territories. In the last year this govt. was abolished and one by a board of commissioners, acting under congressional legislation, installed. Under act of 1878, July 11, the present form of govt. was incorporated; by a board of three commissioners appointed by the president and with authority to prescribe and execute all ordinary municipal regulations, congress retaining the sole right of legislative control. Under this Act half the expenses of the District, previously laid entirely upon the residents, are paid by the national government, as the owner of more than half the real estate. There is no popular suffrage, the entire executive government being in the hands of commissioners appointed by Congress; they recommend legislation and appropriations to the latter, which in turn consults them in the same matters. The government, though not appointed by popular vote, is nevertheless swayed by public opinion. All parts of the district, formerly separate, have been merged into the one general govt., and the city and district are now co-extensive. See WASHINGTON, D. C.

DISTRINGAS, n. *dĭs-trĭng'găs* [L., you may distrain; 2nd pers. sing. pres. subj. of *distringo*, I distrain]: in *law*, a process commanding the sheriff to distrain the defendant by taking his goods and the profits of his lands.

DISTRUST, n. *dĭs-trŭst'* [L. *dis*, not, and *trust*]: doubt or suspicion; want of confidence, faith, or reliance: V. to doubt or suspect; not to confide in or rely on. DISTRUST'ING, imp. DISTRUST'ED, pp. DISTRUS'TER, n. one who. DISTRUST'FUL, a. *-fûl*, suspicious; apt to distrust. DISTRUST'FULLY, ad. *-lĭ*. DISTRUST'FULNESS, n. DISTRUST'INGLY, ad. *-lĭ*. DISTRUST'LESS, a. free from distrust or suspicion.

DISTURB, v. *dĭs-tẽrb'* [OF. *destourber*—from L. *disturbārĕ*, to throw into disorder—from *dis*, asunder; *turbo*, I trouble, I disorder: It. *disturbare*]: to throw into disorder; to stir; to discompose; to ruffle; to agitate; to move from a state of rest, or from a regular order; to interrupt. DISTURB'ING, imp. DISTURBED', pp. *-tẽrbd'*. DISTUR'BER, n. one who. DISTUR'BANCE, n. *-tẽr'băns*, confusion; disorder; a stirring up or excitement; tumult; a disquieting or hindering from the peaceable enjoyment of, as of a right.—SYN. of 'disturb': to perplex; trouble; incommode; move; hinder; disorder; disquiet; molest;—of 'disturbance': brawl; tumult; agitation; derangement; perturbation; commotion; disquiet; excitement; uneasiness.

DISTYLE, n. *dĭs'tīl* [Gr. *dis*, twice; *stulos*, a pillar]: a portico of two columns.

DISULPHIDE, n. *dī-sŭl'fīd* [pref. *di*, twice, twofold, and Eng. *sulphide* (q.v.)]: compounds in which two atoms of sulphur are united to another element or radical; called also bisulphides.

DISUNION, n. *dĭs-ū'nĭ-ŭn* or *dĭs-ūn'yŭn* [L. *dis*, asunder, and *union*: F. *désunion*]: want of concord or agreement; state of not being united; separation; contention. DISUN'IONIST, n. *-ĭst*, a promoter of disunion.

DISUNITE, v. *dĭs'ū-nīt'* [L. *dis*, asunder, and *unite*]: to separate; to disjoin; to part; to fall asunder; to become separate. DIS'UNI'TING, imp. DIS'UNI'TED, pp. DISU'NITY, n. *-ū'nĭ-tĭ*, a state of separation.

DISUSE, n. *dĭs-ūs'* [L. *dis*, not, and *use*]: want or neglect of use; cessation of a custom; cessation of practice or exercise: V. *dĭs-ūz'*, to cease to use; to neglect to practice. DISU'SING, imp. DISUSED', pp. *-ūzd'*. DISUSAGE, n. *dĭs ū'zāj*, gradual cessation of use or custom; neglect of use or practice.

DISVALUE, v. *dĭs-văl'ū* [L. *dis*, and *value*]: to undervalue; to set a low price upon.

DISVEL'LOPED, or DEVEL'OPED, in Heraldry: flying; applied to the unfolded colors of a regiment or army.

DISVOUCH, v. *dĭs-vouch'* [L. *dis*, not, and *vouch*]: in *OE.*, to contradict; to destroy the credit of.

DIT, n. *dĭt* [F. *dit*, a saying (see DITTY)]: in *OE.*, a poem; a tune; a ditty; a theme.

DITA, n. [a native word]: a tree of the Dogbane family (*Apocynaceæ*). It is widely diffused throughout India and the Malayan Islands. It is stiff-branched, attaining a height of 50 ft. to 80 ft., with a furrowed trunk; it has oblong leaves, 3 in. to 6 in. long, and 2 in. to 4 in. wide, produced in fours round the branches. The bark is intensely bitter, and is used by the natives in bowel complaints, and its milky juice as a kind of gutta-percha.

DITCH, n. *dich* [Dan. *dige*, a ditch, a bank: F. *digue*, a jetty, a bank, a corruption of DIKE, which see]: a trench dug in the ground; a moat; any long marshy channel for water: V. to trench; to dig a drain; to form ditches DITCH'ING, imp. DITCHED, pp. *dicht*, surrounded with a ditch or moat. DITCH'ER, n. one who makes or repairs ditches. DITCH BUR, n. *Xanthium strumarium*, plant of the composite order. DITCH-FERN, n. *Osmunda regalis*. DITCH-REED, n. *Phragmites communis*.

DITCH, in Agriculture: open trench cut in the soil to carry off surplus water. It is the oldest and simplest means of draining land, and, though largely superseded by other methods, is still extensively employed. See DRAINAGE. It is specially serviceable on new lands which the owners have had neither time nor capital permanently to improve. Temporary ditches are often made at the ends of fields, to carry off the water which accumulates in the open or 'dead' furrows, and in other places to prevent flooding by heavy rains. A main ditch is made to carry off the water which flows from a series of underground drains; and on very flat land, which cannot be readily drained, large ditches are cut merely to hold the water which would otherwise be distributed through the soil. The banks should always be cut quite sloping in order to prevent caving in by the action of rain and frost. In England the ditch, in connection with the hedge, is extensively used for fencing as well as draining land. The ditch is objectionable because it occupies considerable land, renders cultivation in its vicinity inconvenient, is liable to fill up, is not fully efficient, and by holding stagnant water tends to promote disease.

DITCH, in Fortification: one of the most important of the defense-works of a fortified place. It is a broad and deep trench, that may either be kept dry or filled with water; in practice, it is generally dry. In permanent works, such as the regular fortifications of a town, the *rampart* and the *ditch* are the most important; the former being inside the latter, and formed mainly of the earth excavated from it. The ditch is often 120 ft wide, 12 ft. deep below the natural level of the ground, and 24 ft. beneath the parapet of the rampart. See COVERT WAY.

DITETRAHEDRAL, a. *dī-tĕt ra-hē'dral* [Gr. *dis*, twice, twofold, and Eng. *tetrahedral* (q.v.)]: having the form of a tetrahedral prism with dihedral summits.

DITHEISM, n. *dī'thē-izm* [Gr. *dis*, twice; *theos*, a god]: the doctrine of those who maintain the existence of two gods, one good, the other evil. DI'THEIST, n. *-ist*, one who. DI-

THEIS'TIC, a. *-is'tik*, or DI'THEIS'TICAL, a. *-ti-kal*, pertaining to.

DITHYRAMBIC, n. *dith'i răm'bik*, also DITH'YRAMB, n. *-i-răm* and DITHYRAMBUS [L. *dithyram'bus;* Gr. *dithuram'bos*, a hymn to Bacchus]: originally a surname of Bacchus, of uncertain derivation and meaning; subsequently applied to a species of lyric poetry cultivated particularly at Athens, characterized by loftiness and vehemence of style, which, later, degenerated into bombast and extravagance. The D. was originally a passionate hymn in honor of Bacchus, sung by one or more revellers to the music of a flute; but Arion (q.v.) invented for it a regular choral or antistrophic form. It is this form which is generally spoken of as the dithyramb. It subsequently received various alterations, but no specimens of it have survived. The term is now applied to a poem written in a wild irregular strain. DITHYRAMBIC, a. wild; enthusiastic.

DITMARSH, *dit'mârsh,* NORTH and SOUTH (*Norder* and *Süder Dithmarschen*): western dist. of the German duchy of Holstein, between the Eider and the Elbe; area 500 sq. m.; pop. (1891) 79,828. In old German times, D. formed a part of Saxony beyond the Elbe, and is worthy of special notice, because the inhabitants have preserved to the present day the peculiarities of antiquity. It has its own collection of laws, known as the *Ditmarsh Landbook*, which originated 1321 from 48 judges; was altered 1447, first printed 1497, amended 1567, and finally enjoined anew 1711. Whatever authentic notices, traditional and otherwise, we possess of D., we owe to Joh. Adolfi (1559–1629), whose *Chronik des Landes D* (Ditmarsh Chronicle), written in the Lower Saxon dialect, was published in the original text, with 23 dissertations by Dahlman (Kiel 1827).

DITONE, n. *di'tōn* [Gr. *dis*, twice; *tŏnos*, a tone]: in *music*, an interval of two tones.

DITRICHOTOMOUS, a. *di-tri-kŏt'o-mŭs* [Gr. *dis*, twice, twofold, and Eng. *trichotomous* (q v.)]: divided into twos and threes; applied to a leaf or stem, continually branching off into double or treble ramifications.

DITRIGLYPH, n. *di trĭg'lĭf* [Gr. *dis*, twice, twofold, and Eng. *triglyph* (q v.)]: an interval between two columns, admitting two triglyphs in the entablature. This arrangement of the intercolumniations was peculiar to the Doric order.

DITTANY, n. *dĭt'tă-ni* [OF. *dictame*—from L. *dictamnus:* Gr. *diktamnos*]. (*Dictamnus*): genus of plants of the nat ord. *Rutaceæ*, having a short 5-partite calyx, five somewhat unequal petals, ten stamens, and five 1–3-seeded follicular capsules cohering at the base. The COMMON D., also called BASTARD D., or FRAXINELLA (*D. albus*),—native of sunny mountains and rocks and dry mountain-forests of the south of Europe, especially in calcareous soils—is generally cultivated as a garden-flower. It is a perennial, with stem 1½–3 ft. high, perfectly unbranched, bearing a few pinnated leaves, which have 3–5 pair of

leaflets and an odd one, and terminating in a beautiful erect raceme of 10–20 flowers. The flowers are of fine rose color, with darker veins, rarely white. The plant diffuses a powerful fragrance resembling lemon-thyme, from its numerous oil-glands when in flower, and during dry hot weather exhales such a quantity of volatile oil, that its sudden combustion makes a slight flash when a candle is brought near it on a warm summer evening. The root is thick, white, and very bitter, and was formerly in high repute in medicine as a tonic stimulant, but is now neglected. Dittany of Crete, used as a febrifuge, is a very different plant (*Origanum Dictamnus*) a kind of marjoram (q.v.).

DITTEEAH: see DUTTEEAH.

DITTERS VON DITTERSDORF, *dĭt'tĕrs fŏn dĭt'tĕrs-dorf*, KARL, German musical composer: b. Vienna 1739, Nov. 2; d. 1799, Oct. 31. He is particularly distinguished in comic compositions, and perhaps unrivaled in this branch of music among the German composers. Several of his operas were represented with great applause even in Italy: *Doktor und Apotheker; Betrug durch Aberglauben;* and *Die Liebe im Irrenhause*, were among the most successful of these. He also acquired considerable reputation by his oratorio *Esther*, which secured his elevation to a place among the Austrian nobility.

DITTIED: see under DITTY.

DITTO, ad. *dĭt'tō* [It. *detto* or *ditto*, word, anything said —from L. *dictus*, said—usually contracted *do.*]: the same as above; what has been said before; the same.

DITTOLOGY, n. *dĭt-tŏl'o-jĭ* [Gr. *dissologia*, *dittologia*, a repetition of words—from *dissos*, double: *logos*, a word]: two fold or double reading or interpretation of a text.

DITTON, HUMPHREY, English mathematician: b. Salisbury 1675, May 29; d. 1715, Oct. 15. Through Sir Isaac Newton he received the appointment of mathematical master at Christ's Hospital, which appointment he retained till his death. In 1714, in conjunction with Whiston, he published a new method for finding the longitude at sea, as well as on land. He was the author of several mathematical works, the principal of which are the following: *General Laws and Nature of Motion* (1705); *Institution of Fluxions* (1706); *New Law of Fluids* (1714).

DITTY, n. *dĭt'tĭ* [OF. *dichté* or *ditté*, recitation of an adventure, a story, or a poem; F. *dit*, or *dicton*, a saying, a maxim—from L. *dictum*, a word]: a song; a little poem intended to be sung. DITTIED, a. *dĭt'tĭd*, in the form of a ditty; sung; adapted to music.

DIU, *dē-ô'* seaport, at the e. extremity of an island of the same name off the s. coast of Guzerat, in Hindustan. It is well fortified, having a moderately safe harbor, with a general depth of three or four fathoms. The anchorage is said to be gradually becoming shallower. The place has been in possession of the Portuguese since 1515; but, from its detached and isolated position, its trade is of little consequence. Pop. 12,636.

DIURESIS, n. *dī′ū-rē′sĭs* [Gr. *diourēsis*—from *dĭā*, through, and *ouron*, urine; *diouretĭkos*, having the power of provoking urine]: an increased or excessive flow of urine. DI′URET′IC, a. *-rĕt′ĭk*, having the power to promote the flow of urine: N. a medicine that increases the secretion or discharge of urine: such medicines are much employed in dropsies, as well as in a variety of other diseases. The principal diuretics are the salts of potash, especially the nitrate, acetate, and bitartrate (cream of tartar); squill, in powder, vinegar, or syrup; digitalis or foxglove, in powder or infusion; the decoction or infusion of broom-tops (*scoparium*); the decoction of the American winter-green or pyrola; the alcohols and ethers, with most of the volatile oils, especially that of juniper, as in gin; the berries of the common elder; the tincture of cantharides or Spanish flies; turpentine, etc. The last named (from the alcohols onward in the above enumeration) are more or less irritating in their effects on the urinary organs, and should not be used without medical advice as to the requirements of the particular case. Cream of tartar and the broom-decoction form one of the safest and best diuretic mixtures which can be employed for domestic purposes; or cream of tartar may be given alone, either dissolved in hot water, and allowed to cool, or in substance with syrup.

DIURIDÆ, n. *dī-ūr′ĭ-dē* [Gr. *dis*, twice; *oura*, a tail—in allusion to the lateral lobes of the labellum]: family of orchids, tribe *Neotteæ*. DIUR′IS, n. *-ĭs*, genus of Australian and New Zealand orchids, type of the family *Diuridæ*.

DIUR′NA: see LEPIDOPTERA.

DIURNAL, *dī-ĕr′năl* [F. *diurnal*—from L. *diurnus*, daily—from *dĭĕs*, a day: It. *diurno*]: pertaining to a day; daily; applied to animals that are active during the day; N. in *OE.*, a journal; a day-book. DIUR′NALLY, ad. *-lĭ*.

DIVAGATION, n. *dī-va-gā′shŭn* [L. *divagatus*, pp. of *divagor*, I wander about—from *dis*, away; apart; *vagor*, I wander]: a wandering or going astray; a deviation; a digression.

DIVALENT, a. *dĭv′ă-lĕnt* [Gr. *dis*, twice: L. *valens* or *valen′tem*, strong]: in *chem.*, applied to atoms which have two combining units, and therefore require two monad atoms for saturation: bi equivalent. DIVALENCY, n. *dī-văl′ĕn-sĭ*, the state of having two units of any standard.

DIVAN, n. *dĭ-văn′* [Pers. *diwan*, a tribunal, a collection of writings: It. *divano:* F. *divin:* Ar. *diouânn*]: in Persia, a muster-roll, a register of payments or account; a collection of poems or songs by one and the same author: Goethe uses it in this sense in his *Westöstliche Divan*. In Turkey, an administrative board; the highest council of state at Constantinople is called *Divâni humâjûn*, most illustrious divan; thence, a provincial council, a court of justice; thence a hall, or reception room in palaces and the private houses of the richer citizens: along the walls of the room are ranged low sofas, covered with rich carpets, and provided with many cushions. Hence in western Europe and the United States, the name divan has been applied to a kind of sofa.

DIVARICATE, v. *dī-văr'ĭ-kāt* [L. *divarĭcātus*, spread asunder—from *dis*, asunder; *vārĭcātus*, spread apart, as the legs]: to fork; to part into two branches. DIVAR'ICATING, imp.: ADJ. in *bot.*, coming off from the stem at a very wide and obtuse angle; straggling. DIVAR'ICATED, pp. DIVAR'-ICA'TION, n. *-kā'shŭn*, a forking; a separation into two branches.

DIVE, v. *dīv* [Dut. *duipen*, to duck the head: Icel. *dyfa*, to dive: AS. *dufian*, to plunge in water: Dan. *duve*, to pitch, as a ship]: to sink; to plunge into water head foremost; to thrust the body into water; to go deep into any subject: DI'VING, imp. DIVED, pp. *dīvd*. DI'VER, n. one who dives into water; a kind of sea-bird. See DIVING: DIVING-BELL. DIVING-SPIDER, common water spider: see SPIDER. DIVING-STONE, n. name given to a variety of jasper. DIVE-DAPPER: same as didapper (q.v.).

DIV'EL ON THE NECK; instrument of torture used against the Lollards. It is thus described by Fox, in his *Acts and Monuments:* 'Certain strait irons called the divel on his neck being after an horrible sort devised, straitening and winching the neck of a man with his legs together, in such sort as the more he stirreth in it, the straiter it presseth him, so that within three or four hours, it breaketh and crusheth a man's back and body in pieces'—Cowel's *Interpreter.*

DI'VER, or LOON (*Urinator*): genus of birds of the family *Urinatoridæ* (q.v.) having a strong, straight, rather compressed pointed bill, about as long as the head; a short and rounded tail; short wings, thin compressed legs placed very far back, and tho toes completely webbed. They fly

Head and Foot of Great Northern Diver.

well, but are particularly expert in diving. They prey on fish, which they pursue under water, making as much use of their wings as of their legs and webbed feet in their subaqueous progression. They are scarcely capable, however, of walking on land, and the name *Loon* is supposed to refer to this incapacity, and to be from the same root with *lame*. The GREAT NORTHERN D., or LOON, called also the IMMER or EMBER GOOSE. *U. imber* is a bird about 33 inches long, with much beauty of plumage; the upper parts black, spotted with white; the head black, with tints of green and blue; the belly white. It is a winter visitant of the British coasts, even to the furthest south, and is occa-

sionally seen in inland districts; is found in winter in most parts of Europe, the north of Asia, and N. America, as far s. as Texas, but it breeds chiefly in northern regions, as Labrador, Iceland, and Spitzbergen. It is not exclusively marine, being seen on large rivers, and making its nest on the shores of fresh-water lakes. Its cry is very peculiar and wild, has been likened to the howl of a wolf, and is in some countries superstitiously regarded as ominous of evil. It is easily tamed, and becomes very familiar.—The Black-throated Diver (*U. arcticus*) is another northern bird, of similarly wide geographic distribution, but much smaller size, being only about 26 inches in length. The Red-throated Diver (*U. septentrionalis*) also is found in all

Great Northern Diver (*Colymbus glacialis*).

the northern parts of the world, is more common in Britain than either of the other species, and is the bird generally called Loon on the British coasts. In size it scarcely equals the Black-throated Diver. Its back is brownish-black, the belly white, the throat red. The flesh of all the Divers is dark, tough, and unpalatable. The name Diver is sometimes extended to all the grebes (*Colymbus*), sometimes to all the *Brachypteræ* (q.v.).

DIVERB, n. *dī'vėrb* [L. *diverbium*, a conversation of two, a dialogue—from *dis*, twice; *verbum*, a word]: an antithetical proverb or saying, in which the parts or members are contrasted or opposed. 'England is a paradise for women, a hell for horses; Italy a paradise for horses, a hell for women; as the diverb goes.'—*Burton: Anat. of Melancholy*, p. 601.

DIVERGE, v. *dĭ-vėrj'* [F. *diverger*—from L. *divergĕrĕ*—from L. *dis*, asunder; *vergo*, I incline: It. *divergere*, to diverge]: to spread out from one point; to radiate from one point and recede from each other, as straight lines from the centre of a circle, or rays of light from a luminous body, opposite to *converge*. DIVER'GING, imp. DIVERGED', pp. *-vėrjd'*. DIVER'GENT, a. *-vėr'jĕnt* [F.—L.]: departing or receding from each other; in *bot.*, radiating or spreading outwards from a common centre (see CONVERGENT). DIVER'GENCE, n. *-jĕns* [F.—L.]: a receding from each other. DIVER'GINGLY, ad. *-lĭ*.

DIVERS, a. *dī'vėrz* [F. *divers*, divers, unlike—from L. *diversus*, apart from, different, various—from *dis*, asunder; *versus*, turned]: various; sundry; different; several. DIVERSE, a. *dī-vėrs'*, or *dī'-* [L. *diversus*]: different; various; unlike; more than one. DIVERSE'LY, ad. *-lĭ*, or *dī'-*, in different ways. DIVERSITY, n. *dĭ-vėr'sĭ-tĭ* [F. *diversité*—from L. *diversĭtātem*]: difference; unlikeness; variety; distinct being; not identity. DIVERSIFY, v. *dĭ-vėr'sĭ-fī* [L. *facĭō*, I make]: to make different or various; to give variety to. DIVER'SIFYING, imp. DIVER'SIFIED, pp. *-fīd*. DIVERSIFIER, n. *-fī-ėr*, one who, or that which. DIVER'SIFICA'TION, n. *-kā'shŭn*, variation; the act of making various, or of changing forms; change; alteration. DIVER'SIFI'ABLE, a. *-fī'ă-bl*, that may be diversified or varied.

DIVERSIFLOROUS, a. *dĭ-vėrs-ĭ-flōr'ŭs* [L. *diversus*, different, diverse; *flos*, a flower]: term applied to a plant or inflorescence which bears flowers of two or more kinds.

DIVERT, v. *dĭ-vėrt'* [F. *divertir*—from L. *divertĕrĕ*, to turn one's self away from—from *dis*, asunder; *verto*, I turn; *versus*, turned: It. *divertere*]: to turn aside from business to pleasure; to turn off from any particular direction to another; to turn aside, as a stream; to amuse; to entertain; in *OE.*, to destroy; to subvert. DIVER'TING, imp.: ADJ. giving amusement to. DIVER'TED, pp. DIVER'TER, n. one who. DIVER'TINGLY, ad. *-lĭ*. DIVER'SION, n. *-vėr'-shŭn* [F.—L.]: the act of turning aside; amusement; that which diverts; recreation; sport; the act of drawing the attention of an enemy from the real point of attack.—SYN. of 'diversion': entertainment; pastime; solace; play; games; relaxation; an attack, alarm, or feint;—of 'divert': to please; gratify; exhilarate; delight.

DIVERTICULUM, n. *dī-vėr-tĭk'ū-lŭm*, DIVERTIC'ULA, n. plu. *-ū-lă* [L. *divertic'ulum*, a by-way—from *diverto*, I turn aside]: in *anat.*, a cul-de-sac, or blind lateral tube given off from a main tube.

DIVERTISEMENT, or DIVERTISSEMENT, n. *dĭ-vėr'tĭz-mâng*, also DIVERTIMENTO [F. *divertissement*—from *divertir*, to divert]: species of musical composition consisting of different movements, arranged in an easy style for one or more instruments, but not so elaborately wrought out as the sonata, or other more regular compositions. The divertisement has no fixed character, being a musical

picture without any attempt at artistic effect, or other aim than to please the ear, and may be said to take its place between the *Etude* and the *Capriccioso*. It was greatly in vogue during the last half of the 18th c.; until then, the word had never been used to denote a musical composition. The name is now applied to an entertainment, of dances and songs, introduced between the acts of an opera, or play, as a diversion during the pause: it was thus used in France much earlier than in Italy or Germany.

DIVES, n. *dī'vēz* [L. *divēs*, rich, after the rich man in the parable]: a rich, miserly sinner. DIVS or DEEVS, n. plu *dēvz*, demons of the Persian mythology: see DEVIL.

DIVEST, v. *dĭ-vĕst'* [It. *divestire;* OF. *dévestir;* F. *dévêtir*, to undress—from L. *dis*, asunder; *vestis*, a garment]: to strip, as of clothes, arms, etc.; to deprive of; to dispossess. DIVES'TING, imp. DIVES'TED, pp. DIVES'TURE, n. *-tūr*, the act of stripping or depriving: also in *OE.*, DEVEST, which see.

DIVIDE, v. *dĭ-vīd'* [L. and It. *dividĕrĕ*, to part asunder, to distribute: Sp. *dividir*, to divide]: to separate or part; to part a thing into two or more pieces; to keep apart; to distribute; to give in shares; to part or open; to cleave; to separate for the purpose of voting, as in parliament. DIVI'DING, imp. DIVI'DED, pp. DIVI'DER, n. one who or that which divides. DIVI'DERS, n. plu. compasses. DIVI'DINGLY, ad. *-lĭ*. DIVI'DABLE, a. *-vī'dă-bl*, that may be divided. DIVIDANT, a. *dĭ-vī'dănt*, in *OE.*, separate; different DIVIDUAL, a. *dĭ-vĭd'ū-ăl* [L. *divĭdŭŭs*, that can be divided]: in *OE.*, that can be shared or partaken of in common with others; divided.—SYN. of 'divide': to separate; detach; disjoin; disconnect; part; sever; sunder; share; apportion; disunite; graduate; open.

DIVIDEND, n. *dĭv'ĭ-dĕnd* [F. *dividende*—from L. *dividenda*, requiring to be severed or cut off: It. *dividenda*, a dividend, a share (see DIVIDE)]: a part or share of the profits or gains of a public company engaged in business of any kind, as a bank or railway, which may be available for distribution among the proprietors: usually declared half-yearly, by order of the directors: occasionally the dividends do not exhaust the profits, and the surplus is allowed to accumulate till it is paid to the shareholders as an extra dividend or *bonus*. D. is also the interest payable on any portion of the national debt or other stock: the part or share due to each creditor from funds realized from a bankrupt's effects, or from the payment of a composition: in *arith.*, the number to be divided.

DIVID'ING ENGINE: see GRADUATION.

DIVIDIVI, *dĭ'vĭ-dĭ'vĭ*, or LIBIDIBI, *lĭ'bĭ-dĭ'bĭ:* curved pods of *Cæsalpinia coriaria* (see CÆSALPINIA), a tree on the coasts of Curaçoa, Carthagena, and other parts of tropical America. They have been long used there for tanning, but have recently acquired importance as an article of commerce. A considerable quantity is now annually exported to Britain. It is one of the most astringent substances known.

DIVINATION.

DIVINATION: act of discovering the hidden, particularly the future, in a supernatural way. Men have at all times set their own imaginations above the causes of nature, and by a curious subjective process, have endeavored to draw out of themselves what they should have sought only by study of the laws of nature. Thus, have been instituted systems of superstition among almost all nations, which scientific discovery and rational Christianity have not wholly eradicated: so that, even among comparatively enlightened peoples, there remains a deep substratum of this old-world feeling. A special use of the term D. is to denote fortune-telling or sorcery (middle-age Latin *sortiarius*, one who reads the future by means of lots or *sortes*). It was a maxim with the nations of antiquity, that if there are gods, they care for men; and if they care for men, they will send them signs of the destiny which they appoint for men. This, with some variations, has been a universal sentiment in all ages and countries. But it was the first step in this journey which presented the whole difficulty. How was man to know the appointments of the gods? The variety of answers to this question constitutes the history of divination. Thus, among the Greeks, the word for D. was *mantikē*, which signified more than the Latin *divinatio;* inasmuch as it was applied to any means by which the Deity discloses himself to man, while the Latin word denoted more the power which man is supposed to possess of discovering the future. With the Greeks, the seer was passive; with the Romans, he was active: see SEER: ORACLE. Astrology (q.v.) was a favorite method of D. among the ancient Chaldeans, as well as in the middle ages. *Auguries* and *auspices*—both words derived from *avis*, a bird—were systems brought to perfection by the Romans as means of knowing the will of the gods: see AUGURIES and AUSPICES. The sacrifice of beasts, besides, the casting of the horoscope, and the observing of the constellations, all were favorite modes of guessing at the future practiced by the Romans. The Araucanians, a warlike nation of S. America, seem to have placed as implicit faith in the divination of birds as did the Romans, and their practice of this art was similar. Even among ourselves, the merry-thought bone of fowls is deemed to possess a curious virtue.

An extensive set of omens have been taken from observing what first happens to one, or what animal or person one meets first in the morning, or at the commencement of an undertaking—the *first-foot*, as it is called. To stumble, has been universally held to presage misfortune. Some semblance of a reason might be found for this belief, inasmuch as stumbling may be supposed to indicate that self-possession and conscious courage, which are in themselves half a victory over circumstances, are lacking—the want of them, therefore, being half a defeat; but in most cases the interpretation seems altogether arbitrary. The dread of a hare crossing the path seems widely prevalent in Britain; while to see a wolf is a good omen. This feeling is probably a remnant of warlike times, when the timid hare suggested

thoughts of cowardice and flight; while the bold wolf, sacred to Odin, was emblematic of victory. The character of the hare for being unlucky is also connected with the deep-rooted belief, that witches are in the habit of transforming themselves into hares. That to meet an old woman is unlucky, is another very general belief; arising, without doubt, from the same causes that lead to their being considered witches. In some places, women in general are unlucky as 'first-foot,' with the strange exception of women of bad reputation. This belief prevailed as far back as the age of Chrysostom. Priests, too, are ominous of evil. If hunters of old met a priest or friar, they coupled up their hounds, and went home in despair of any further sport that day. This superstition seems to have died out, except in the case of sailors, who still consider the clergy a 'kittle cargo,' as a Scotch skipper expressed it, and anticipate a storm or mischance when they have a black-coat on board. This seems as old as the days of the prophet Jonah.

The observation of *lucky* and *unlucky* days was anciently important, and was often the turning-point of great events. It is now confined to the one subject of marriage. In fixing the wedding-day, May among months, and Friday among days, are shunned by many people in all social classes; for in this matter, which is the exclusive province of women, and in which sentiment and fancy are more active than reason, the educated and uneducated are reduced to a level. Perhaps half the superstitious beliefs that yet survive among civilized and Christian communities, group themselves round the subject of love and marriage—of such intense interest to all, yet so mysterious in its origin, and problematical in its issue. The liking or passion for one individual rather than any other, is so unaccountable, that the god of Love has been fabled blind; it is of the nature of fascination, magic, spell. And then, whether happiness or the reverse shall be the result, seems beyond ordinary calculation. All being apparently given over to mystery, chance, fortune, any circumstances may, for what we know, influence or indicate what fortune's wheel shall bring round. Hence the innumerable ways of prognosticating which of two or more persons shall be first married, who or what manner of person shall be the future husband or wife, the number of children, etc. It is generally at particular seasons, as at the Eve of St. Agnes and Hallowe'en, that attempts are made thus to lift the veil of the future.

Sneezing, likewise, has long been looked upon as supernatural, for this reason, that it is sudden, unaccountable, uncontrollable, therefore ominous. The person is considered as possessed for the time, and a form of exorcism is used. A nurse would not think she had done her duty if, when her charge sneezes, she did not say: 'Bless the child,' just as the Greeks, more than two thousand years ago, said: 'Zeus protect thee.'

It is important to observe that an *omen* is conceived to be not a mere sign of what is destined to be but as causing

in some mysterious way the event that it forebodes; and the consequence, it is thought, may be prevented by some counteracting charm. Thus the spilling of salt not only forebodes strife, but strife is conceived as the consequence of the spilling of the salt, and may be hindered by taking up some of the spilled salt and throwing it over the left shoulder.

An important exercise of the diviner's art is to determine the innocence or guilt of parties: see ORDEAL. It would be impossible to enumerate the endless modes of divination for which learned names have been found. Some of the principal are—*Axinomancy* (q.v.), *Belomancy* (q.v.), *Bibliomancy* (q.v.), *Botanomancy*, or divination by means of plants and flowers (practiced by the ancients, who were wont to bruise poppy-flowers between their hands, under the conviction that they could thereby discover their loves: hence Theocritus calls the poppy *Teliphilos*, quasi *Deliphilos;* i.e., a *tell-love*. Goethe has made a beautiful use of another form of this superstition, which existed among the Teutonic races no less than among the old Greeks. The child-like Marguerite, in *Faust*, seeks to discover whether or not Faust loves her by plucking the leaves from a star-flower, murmuring alternately, 'He loves me,' 'He loves me not,' and finds to her joy that the *last* leaf comes away while she is saying, 'He loves me'); *Capnomancy* (q.v.), *Cheiromancy* or *Chiromancy* (q.v.), *Coscinomancy* (q.v.); *Crystallomancy* (q.v.), *Cup, Divination by* (q.v.); *Geomancy* (anciently practiced by casting pebbles on the ground, from which conjectures were formed; but the Arabian geomancy was more recondite, being founded on the effects of motion under the crust of the earth, the chinks thus produced, and the noises or thunderings heard); *Hydromancy*, divination, by water or by a mirror, in which the diviner shows the image of an absent person, what he is doing, etc. (this mode of divination plays an important part in the Arabian romances); *Lithomancy*, a species of divination performed by stones, but in what manner is not known; *Oneiromancy* (see DREAMS); *Palmistry* (see CHIROMANCY); *Pyromancy*, or divination by flame (common among the Greeks and Romans; if the flame of the sacrifice was vigorous and quickly consumed the victim, if it was clear of all smoke, and did not crackle, but burned silently in a pyramidal form, the omen was favorable; otherwise, not); *Rabdomancy* (see DIVINING-ROD); and *Teraphin* (q.v.).

DIVINE, a. *dĭ-vīn'* [OF. *divin*, divine; *diviner*, to predict—from L. *divīnus*, of or belonging to a deity—from *dīvus*, a god: It. *divino*]: pertaining to the true God; heavenly; sacred; excellent in the highest degree; above human; in *OE.*, prophetic; prescient: N. a minister of God; a clergyman; a priest: V. [L. *divīno*, I foretell]: to foretell or predict; to guess or conjecture; in *OE.*, to use or practice divination. DIVI'NING, imp. DIVINED', pp. *-vīnd'*. DIVINATION, n. *dĭv'ĭ-nā'shŭn* [F.—L.]: foretelling future events; the pretended discovery of things secret or future by certain rites, or by attention to certain omens or appear-

ances, as the flight of birds or entrails of animals; augury. DIVINATORY, a. *dĭv'ĭ-nā'ter-i*, having the nature of, or connected with, divination. DIVINE'NESS, n. divinity; supreme excellence. DIVINE'LY, ad. *-lĭ*, in a divine or godlike manner. DIVI'NER, n. one who pretends to predict future events by supernatural means. DIVINING-ROD, a rod, usually made of hazel, with forked branches, used by those who pretend to discover water or metals by its means. DIVINIZE, v. *dĭv'ĭn-īz*, to invest with a divine character; to deify. DIV'INIZ'ING, imp. DIV'INIZED, pp. *-īzd*. DIVINITY, n. *dĭ-vĭn'ĭt-ĭ* [F. *divinité*—from L. *divinĭtātem*, the divinity, the Godhead]: the divine nature or essence; the Deity; the Godhead; God; a false god; a celestial being, inferior to a god; the science of divine things; theology.—SYN. of 'divine, a.': holy; godlike, superhuman; supernatural; of 'divine, v.': to foretell; presage; prognosticate; predict; guess; foresee; foreknow; detect; augur.

DIVINE' RIGHT, OF KINGS: term applied to describe the source of the power claimed for the monarch, by the royalist party, in the great controversies between the monarchical and the parliamentary or commonwealth parties in England in the 17th c. The monarch was held to be the immediate representative of the Deity, to whom alone he was responsible for all his actions—a principle which relieved him from all human responsibility. The idea was little known in Great Britain until the quiet transfer of the crown from the Tudor to the Stewart dynasty showed that the hereditary principle was firmly established. It was found by some ecclesiastics in the doctrines of the civil law, which, in imitation of the practice of oriental nations, flattered the Roman emperors by attributing to them a power founded on divine institutions. Throughout a long and miserable contention divine right was on one side claimed to be the source of political power, while on the other it was maintained that that power emanated from the will of the people, expressed in what was called 'the social contract.' The chief writers on the side of divine right were Salmasius and Sir Robert Filmer; on the other, Milton, Algernon Sydney, and Harrington.

DIVINE' SER'VICE, in Old Law: tenure by which the tenant was bound to do some special divine service, e. g. to sing so many masses, to distribute a certain sum in alms, or the like. It differed from Frankalmoigne (q. v.) in this, that the feudal lord could distrain for the former, not for the latter, which, being an indefinite service, could be enforced only by a complaint to the ordinary or visitor.

DIV'ING: plunging deeply under water, usually headforemost. The 'treasures of the deep' have at all times been the subject of much visionary exaggeration, and the accounts of the exploits of divers equally extravagant. In school-books children were once seriously informed that the pearl-divers of the East acquire by practice the power of remaining under water 15 to 20 minutes. In

narrative of ancient date, the time is extended to two hours. It need scarcely be said that these accounts are absurd, no such endurance being possible. The more skilful divers may remain under water, two, or even three minutes; some modern accounts say four, and even six, but this is very doubtful. Most divers suffer severely from the continual efforts in holding the breath; bloodshot eyes and spitting of blood are common among them. This rude mode of living is now little used except for pearl and sponge fishing; and even for these purposes, only among uncivilized people, as the modern applications of science afford immense advantages for all kinds of subaqueous operations. See DIVING-BELL; DIVING-DRESS.

DIVING-BELL, a device by which work may be carried on under water with a full supply of atmospheric air. To illustrate the principle of this machine take a glass tumbler, plunge it into water with the mouth perpendicularly downward; it will be found that very little water will rise into the tumbler, but as air is compressible, it could not entirely exclude the water, which by its pressure condensed the air a little.

The first diving-bell we read of in Europe was tried at Cadiz by two Greeks in the presence of the Emperor Charles V. The first of any note was made by Dr. Halley. The diving-bell is most commonly made in the form of a truncated cone, the smaller end being closed and the larger one open. It is so suspended that it may sink full of air, with its open base downward. As a diving-bell of the ordinary construction is open to the objection of not being easily moved about, an ingenious kind of diving-bell, called a *nautilus*, has been invented, which is not open to this objection, but which is entirely at the command of the occupants, who can make it sink or swim, and move it about at pleasure, and can use it at the same time to raise great weights and convey them to any desired spot.

DIVING-DRESS: to enable divers to remain for a considerable time (sometimes five or six hours) under water a diving dress has been used, which is so contrived that the diver is constantly supplied with air from above. It consists of a waterproof dress, to which is attached a neck-piece or breast-plate fitted with a segmental screw bayonet joint to which the head-piece or helmet, the neck of which has a corresponding screw, can be attached or removed by one-eighth of a turn. Air is supplied by means of a flexible tube, which enters the helmet and communicates with an air-pump. To allow the escape of the used air there is another flexible tube which is led from the back part of the helmet to the surface of the water. There is a signal line attached to the diving dress, by which the diver communicates with the attendants, and he carries another line in his hand to guide him in returning to the rope or ladder by which he descends.

The diving apparatus now in use makes the diver independent of any connection with persons above the water. A strong metallic air reservoir of steel is carried on the

diver's back. A respiratory tube issues from the chamber, and is terminated by a mouth-piece which is held between his lips and teeth. This tube is furnished with a valve which permits the expulsion of air, but opposes the entrance of water. When the diver wishes to leave the water he inflates his dress with air from his reservoir and immediately rises to the surface.

DIVIN'ING-ROD—often called *Virgula Divina*, or *Baculus Divinatorius*, the Caduceus or wand of Mercury, the Rod of Aaron, etc.: a forked branch, usually of hazel, sometimes of iron, and even of brass and copper, by which it has been supposed that minerals and water have been discovered beneath the surface of the earth. The rod, when suspended by the two prongs, often between the balls of the thumbs, will distinctly indicate, by a decided inclination, it is alleged, the spot over which the concealed mine or spring is situated. Other powers are ascribed to the divining-rod, but this is the chief. Some men, claiming to be scientific, have been believers in the occult power ascribed to this magic wand. Agricola, Sperlingius, and Kirchmayer, all believed in its supernatural influence. So did Richelet, author of the dictionary. The learned Morhoff remained in suspense, while Thouvenot and Pryce, in the latter part of the 18th c., gave ample records of its supposed power. Bayle, in his Dictionary, under the word *Abaris*, gives some ingenious arguments both for and against the divining-rod. In a work published by Dr. Herbert Mayo, 1847 and '51, *On the Truth Contained in Popular Supersititıons*, he gave some curious illustrations of the art, supposed to be possessed by one in forty of the Cornish miners. At Weilbach, in Nassau, he met with one Edward Seebold, who, he says, possessed the power, but afterward lost it. Arthur Phippen, 1853, published a pamphlet containing an account of two professional diviners or dowsers. One of them, named Adams, gave remarkable indications of being able to detect water under ground. He not only was able to discover the particular spot where water might be found, he could even perceive a whole line of water running underground.

Scientific men, who have bestowed any care on the examination of nature, regard this alleged power of the divining-rod as an unconscious delusion, ascribing the whole phenomenon to the effect of a strong impression on the mind acting through the agency of the neves and muscles. See ANIMAL MAGNETISM.

DIVIRIGI, *dī-vĭr'ĭ-jī* (anc. *Tephrene*): town of the province of Sivas, Asia Minor, on the Kurner-Su, a branch of the Euphrates, 28 m. n.w. from Arabkir. Pop. supposed about 10,000.

DIVISI, ad. *dē-vēz'ē* [It.]: a direction that instruments playing from one line of music are to separate and play in two parts. The reunion of the parts is directed by the words *a due*.

DIVISIBIL'ITY: that property of quantity, matter, or extension, through which it is either actually or conceivably

separable into parts. Whether matter is or is not indefinitely divisible, is a question which has occupied the minds of philosophers since very early times: see ATOM. There is no doubt that, abstractly speaking, it is indefinitely divisible. We cannot conceive any body or space so small but that we can subdivide it in imagination, and thus figure to ourselves bodies and spaces still smaller; and practically, we know that the subdivision of matter is carried in nature far beyond appreciation either by our senses or by calculation. The diffusion of odors through the air for long periods from odoriferous bodies without their suffering any sensible change of weight, and the tinging of great quantities of fluid by very minute portions of coloring matter, are cases commonly adduced in proof of the extreme fineness of certain material particles; while, by experiment, it is shown that there is no practical limit to the divisibility of even the most solid substances. Thus, an ounce-weight of silver, gilt over with eight grains of gold, has been drawn out into a wire 13,000 ft. long, which was all its length covered with the gold; and a tube of glass presented to the blow-pipe has been drawn out till it became as fine as a silk fibre, or $\frac{1}{5000}$th of an inch thick, still retaining its character as a tube with a distinct interior and exterior surface. In fact, in theory, great and small are mere terms of relation; under the microscope, objects invisible to the eye appear of considerable bulk; and as Sir John Herschel, in his celebrated *Introduction to the Study of Physical Sciences*, has put it, there is no reason why a mote in a sunbeam should not be in itself a world. With regard to the indefinite divisibility of space, it may be demonstrated geometrically; and perhaps, after all, it is the feeling that space is infinitely divisible, which compels our minds most strongly to resist the notion of ultimate atoms with definite forms, as conceived in the corpuscular theory.

DIVISIBILITY, in arithmetic and algebra: the quality possessed by a number or algebraic expression of admitting division by another without leaving a remainder. The only universal test is by actual division or by showing that all the factors of the divisor are also contained in the dividend. But in some cases simpler means are available, notably in arithmetic in the simple cases of division by 2, 5, 10, etc. A number is divisible by 8 if the number represented by its last three digits is divisible by 8; thus $123512 \div 8 = (123 \times 1000 + 512) \; 8 = 123 \times 125 + 64$. Again no division by 9 every power of 10 (10, 100, 1000, ...) leaves the remainder 1; hence $237154 = 2.10^5 + 3.10^4 + 7.10^3 + 1{,}10^2 + 5.10 + 4$ leaves the remainder $2 + 3 + 7 + 1 + 5 + 4$ or 22, which again has the remainder 4. If then any number is divided by 9, the remainder is the same as that of the sum of its digits; if this is 0, the number is divisible by 9. Similarly a number is divisible by 11 if the sum of its digits taken alternately + and— is divisible by 11. Such rules can be found for division by any number, but they usually present no particular advantage over actual division. Thus a number is divisible by 7 if, on multiplying its

digits successively from right to left by 1, 3, 2, 6, 4, 5, 1, 3, 2, ..., the sum of the resulting number is divisible by 7.

In algebra the remainder on dividing a polynomial $a_0x^n+a,\ x^{n-1}+\ldots+a_n$ by $x—h$ is found to be $a_0h^n+a,\ h^{n-1}+\ldots+a^n$, *i, e.*, the same polynomial written in h instead of x. If there is to be no remainder we must have $a_0\ h^n+a,\ h^{n-1}+\ldots a_n=o$. Thus $x^5—3x^4+7x^2—9x+6$ is divisible by $x—2$, since $2^5—3.2^4+7.2^2—9.2+6=0$. See FACTORS.

DIVISIBLE, a. *dĭ-vĭz′ĭ-bl* [F. *divisible*—from *diviser*, to divide—from L. *divīsus*, separated, divided]: capable of division; that may be separated into parts. DIVIS′IBLY, ad. *-blĭ*. DIVIS′IBIL′ITY, n. *-bĭl′ĭ-tĭ*, the property possessed by bodies of being separated into parts. DIVIS′IBLENESS, n. *-bl-nĕs*. DIVISION, n. *dĭ-vĭzh′ŭn* [F.—L.]: the act of dividing or separating into parts; that which divides or separates; the part separated; a compartment; a part or distinct portion, as of an army, a fleet, a discourse; variance; difference, a process in arithmetic by which is ascertained how many times one number or quantity is contained in another; in either house of parliament, the separation of the members into two parties for the purpose of voting on opposite sides of a question: in *military matters*, body of troops being a section of an army temporarily established for convenience, indefinite in numbers, consisting of two or more brigades of infantry or cavalry, with some artillery. *Naval Division*, formerly a secondary group of ships in a large fleet, usually three to a squadron; now disused, as ships are too gigantic to admit of many being manœuvred in one fleet. *Benefit of Division*, in *Scottish law*, privilege of a co-cautioner to restrict, under certain circumstances, his liability for a guaranteed debt to his own proportion of it. DIVIS′IONAL, a. *-ŭn-ăl*, pertaining to a division; denoting a division. DIVI′SIVE, a. *-vī′zĭv*, creating division or discord. DIVI′SOR, n. *-zĕr*, in *arith.*, the number by which the dividend is divided (see DIVISION, in Arithmetic: PRIME NUMBERS). DIVISIONAL PLANES, in *geol.*, those lines of separation which traverse rock-masses, and divide them into blocks or fragments more or less regular.—SYN. of 'division': section; partition; share; difference; disunion; discord; portion; segment; alienation; contrast.

DIVISION, in Arithmetic and Algebra: one of the four elementary operations, that by which it is found how often one number (the *divisor*) is contained in another (the *dividend*), the result being the quotient. Division is a compendicus method of subtraction, by which we take the divisor from the dividend as often as the one is contained in the other. The symbols for division are $a\div b$, or $a : b$, or a / b, where a is the dividend and b the divisor. The quotient is the same as the ratio.

The various methods of division which have prevailed from time to time since the 15th century differ only in the manner of arranging and disposing the numbers. By a process of evolution the non-essential features have eliminated, so that there is today practically only one method,

although some minor variations still occur. Decimals are treated like integers, with due regard for the position of the decimal point in the quotient. Division by a common fraction is performed by multiplication by its reciprocal. Division in algebra is essentially the same process as in arithmetic, after the terms of dividend and divisor have been arranged in convenient order. In *synthetic* division only the coefficients are actually written down, the powers of x being omitted.

DIVISION: in Logic: consists in the enumeration of the objects or classes of objects which a term denotes. Division implies *definition*, for we cannot divide a generic term if we do not know the specific differences which belong to it. The division of a term may be carried out in many ways, according to the point of view chosen. One might divide men, for example, into liars and non-liars, or into Europeans and non-Europeans. A division of this sort, by which a concept is divided into *two* mutually exclusive classes, one being the contradictory of the other, is called *Dichotomy*. It is based on the law of *Excluded Middle*—'A must be either B or not B,' 'there is no middle ground between opposites.' The scholastic logicians divided all objects of thought in this way, beginning with 'Being' into 'corporeal and incorporeal,' 'corporeal' into 'animate and inanimate,' etc. If a third possibility be admitted we have Trichotomy or threefold division, and so we might go on. If widely applied, it is evident that this sort of division becomes extremely artificial. Within narrow limits and for special purposes it is of value. A division, to be of extended and permanent usefulness, should be based on significant principles and then becomes *Classification* (q.v.). The following rules are given for division: (1) There must be but one principle of division; to divide men into Europeans, Asiatics, and laborers is a violation of this rule; (2) No two members of a division should overlap—the above example illustrates the violation of this rule; (3) The division must be exhaustive, i.e., cover the whole of the class divided.

DIVISION, U. S. Military: formerly one of three sections of the country; abolished 1891; revived 1898. The territory of the United States was divided (1903) into a division (the Philippines) with the departments of Luzon, the Visayas, and Mindanao; and eight other departments, as follows: *Dept. of Cal.:* comprising the states of Cal. and Nev., and Hawaii; *Dept.* of *Col.:* Wyo., Col., Ut., Ariz., and N. M.; *Dept. of Colum.:* Wash., Or., Ida., and Alaska; *Dept. of Dakota:* Minn., N. D. S. D. Mont., and the parts of Wyo. and Ida. in the Yellowstone National Park; *Dept. of the East:* New England States, N. Y., N. J., Penn., Del., Md., D. C., W. Va., N. C., S. C., Ga., Fla., Ala., Miss., La.; and Porto Rico; *Dept. of the Lakes:* Wis., Mich., Ill., Ind., O., Ky., and Tenn., *Dept. of the Missouri:* Ia., Neb., Mo., Kan., Ark., Ind. Terr., and Okl.: *Dept. of Texas:* Tex., the Div. of the Philippines and the Depts. of Cal., the Lakes, and the

Missouri are commanded by Maj. gens., the others by brig. gens.

DIVISOR, a number by which another is divided; it is an *exact* divisor when there is no remainder. *Greatest common divisor* (abbreviated to *G. C. D.*) the product of all the common factors of two numbers; now usually called the *highest common factor* (*H. C. F.*). The same terms are used in the case of algebraic expressions.

DIVISION OF LABOR, or of EMPLOYMENT: important topic in political economy, including the means by which labor is economized, or, in another method of stating the same result by which production is increased. The problem in division of labor is so to adjust matters in any given community that each member of it shall work, or be able if he chooses to work, with the greatest possible results. In practice it is, like most other arrangements, apt to be too broad or too narrow. The old term, 'jack of all trades and master of none,' expresses a truth. On the other hand, few people can do any sort of work to great perfection, unless it is part, as it were, of a group of functions for all of which they are more or less prepared. A good dentist will be in some measure a surgeon; a conveyancer or a special pleader will know something of the other departments of legal practice; a shipwright will be able, on occasion, to do other kinds of carpentry, and he will be the better for a general knowledge of the mechanical powers. That division of labor, in fact, which is really productive, is where a man who can do several things selects one as that which he can do best, or has most opportunity of doing. There is an important difference between this selection of a special pursuit, and the inability to do more than one thing, which is often confounded with it. In the former case, the worker, whether with head or hand, has great resources, for his adopted pursuit is the best, out of several others, on which he can fall back. Indeed, as the one thing which can be so done is generally a very simple thing, it is almost a law in political economy that it will come to be superseded by machinery. Of the divisions of unskilled and easy labor, there is an excellent illustration in Adam Smith's description of pin-making: 'One man draws out the wire, another straights it, a third cuts it, a fourth points it, a fifth grinds it at the top for receiving the head; to make the head requires two or three distinct operations; to put it on is a peculiar business; to whiten the pin is another; it is even a trade by itself to put them into a paper; and the important business of making a pin is in this manner divided into about eighteen distinct operations which in some manufactories are all performed by distinct hands.' Smith offers the following reasons why the division of labor secures greater efficiency: 'First, the increase of dexterity in every particular workman; secondly, the saving of the time which is commonly lost in passing from one species of work to another; and lastly, the invention of a great number of machines which facilitate and bridge labor, and enable one man to do the work

of many. Essays, however, were written to prove that in manufacturing countries human beings were deteriorating, as no one of them had the faculty of self-support in separation from his fellows, and none could even make a single article by himself, all being dependent for their bread on a complex co-operation, which might break down any day. The answer appears in the pin-making of the present day, where one man tends a machine, feeding it with wire at one end, while the pins drop out at the other. This, too, is the fruit of division of labor, for many skilled heads and hands have been occupied in bringing to perfection the different parts of the machinery. It is of the highest importance to the working-classes of a country, to keep in view that though the division of labor does sometimes create functions which, while they are extremely simple and easy, are of value as helping other functions to go on, yet this kind of easy and uniform work has no stability, and the possession of the facility for doing it acquired by practice is no permanent industrial endowment, since it is likely some day to be superseded by machinery.

The principle of division of labor has been applied in the great majority of modern trades and industries. Years ago, when the apprenticeship system prevailed generally, a novice was instructed in all the minutiæ of his trade, and on the completion of his time was competent to perform every part of the labor involved in making the article of his trade. Within a comparatively few years, however, all this has been changed. The few apprentices that are now allowed in the factories and shops are trained to do a specific portion of the work, not the whole of it; and each workman works only one branch of the trade. But while this division of labor prevents a single workman making the article from beginning to end, it has the advantage of creating just so many more branches of skilled labor, as in hat making for instance, which now requires expert formers, dyers, binders, tipmakers, and other special operators.

In Biology, a conception borrowed from economics and introduced into biology by Milne-Edwards to describe the difference of function exhibited by the individual members of an animal colony, or by the different organs, tissues, and cells of a single organism. The figure of a hydroid colony, *Hydractinia*, shows how members, primarily and fundamentally the same in structure, become set apart as nutritive, reproductive, sensitive, and protective. The same division of labor or predominance of special functions in different individuals is beautifully illustrated in the *Siphonophora*.

DIVITIĀ'CUS, chief of the Ædui, often mentioned in the *Commentaries of Cæsar*. He was a constant adherent of the Romans, and on one occasion made a visit to Rome, where he became the guest of Cicero, who mentions him in his book, *De Divinatione*, as belonging to the order of the Druids, and professing much knowledge of the mysteries of nature and the art of divination.

DIVORCE.

DIVORCE, n. *dĭ-vōrs'* [F. *divorce*—from L. *divortĭŭm*, a separation from another—from *dis*, asunder; *versus*, turned; It. *divorzio*]: a separation from another; the dissolution of the marriage bond; a legal separation between husband and wife, by which one or both become free to marry another; a separation of things closely united: V. to dissolve the marriage-bond; to separate or disunite things closely connected; to force asunder; to put away. DIVOR'CING, imp. DIVORCED', pp. *-vōrst'*. DIVORCE'MENT, n. divorce. DIVOR'CER, n. *-sẽr*, one who. DIVORCE'ABLE, a. *-ă-bl*, that may be divorced. DIV'ORCEE', n. *-vōr-sē'*, a person divorced. DIVORCE'LESS, a. that cannot be divorced.

DIVORCE', in Law: dissolution of marriage, by a competent court on due cause shown. In heathen nations, divorce was granted often on the slightest grounds. Even among the Romans, marriage was regarded as little more than a conventional union, to be observed so long only as it suited the mutual convenience of the spouses. One ancient nation, the Hebrews, had a system of laws in which marriage was guarded under a divine sanction. Christian nations, adopting as the basis of their systems the same Scriptural law, as authoritatively developed and declared by Christ—Matt. xix, Mark x, 9–11; Luke xvi. 18; and as in I. Cor. vii. 16, 11, are agreed in considering marriage a sacred tie, not to be dissolved except on the ground of adultery; though in some systems of laws the ground is enlarged to include cruelty, wilful desertion, habitual drunkenness, etc. Even the most limited ground for dissolution of marriage is denied by a large portion of the Christian world. By the civil law, as it existed for some centuries after Christianity, a greater laxity was allowed in regard to divorce. The emperor Constantine was the first to prohibit dissolution of marriage by simple consent of the parties. That practice was revived under the emperors Theodosius and Valentinian; and though those emperors subsequently rescinded this edict, yet the rule as to the grounds on which marriage might be dissolved continued to fluctuate. By the canon law, marriage was regarded as a sacrament; and though marriages contracted in disobedience to certain rules might be declared null *ab initio*, a marriage validly contracted would not be dissolved except by papal dispensation. But the rule of the canon law was not uniformly adopted by the states of Europe, and it was not till the famous Council of Trent issued a decree, in its 24th session, 1562, declaring marriage indissoluble even after the adultery of one or both of the parties, that a uniform rule on the subject was established. But before this decree was issued, the reformation had made progress throughout Europe, and thus a change again took place in regard to the law of divorce. It should be observed, that though by the canon law divorce *a vinculo matrimonii* was unattainable, parties might obtain a separation *a mensâ et thoro*. The nature of this remedy will be explained below.

Rom. Cath. countries adopted the principle laid down by the Council of Trent, and this rule continues in force in

most countries in that communion. But by the Code Civile of France, divorce is allowable on the ground of adultery and certain other causes. Countries which adopted the reformed religion, have varied greatly in the rules established as to divorce. In Holland, it is permitted on the ground of adultery and desertion. In the United States, the practice varies in different states. 'In several of them no divorce is granted but by special act of the legislature, according to the English practice; and in others, the legislature itself is restricted from granting them, but it may confer the power on courts of justice. So strict and scrupulous has been the policy of South Carolina, that until recently there was no means of obtaining a divorce of any kind, either by sentence of a court of justice or by act of the legislature. In all other states, divorce *a vinculo* may be granted by courts of justice for adultery. In New York the jurisdiction of the courts as to absolute divorce for causes subsequent to marriage is confined to the single cause of adultery; but in most of the other states, in addition to adultery, intolerable ill-usage or wilful desertion, or unheard-of-absence, or habitual drunkenness, or some of them, will authorize a decree for divorce *a vinculo* under different modifications and restrictions.'—Kent, *Comm.* iv. 105. In case of divorce, alimony (q.v.) is usually in the discretion of the court. As to custody of children, other things being equal, the father's claim has precedence; but the first consideration is the welfare of the children, and the next is the right of the innocent parent.

In England, previous to the passing of the late Divorce and Matrimonial Act (1857, amended 1873), marriage was by the common law indissoluble. It was, indeed, competent to obtain a declaration of nullity of marriage on the ground of relationship, previous marriage of one of the parties, mental or physical incapacity, or coercion. But the judgment so obtained was not a decree of divorce, but a declaration that marriage between the parties had never really been contracted. A wife may now (since 1857, by a decree of the 'divorce and matrimonial court,' included in the probate, divorce, and admiralty division of the high court of justice) obtain a divorce on the ground of the husband's incestuous adultery, or of his bigamy with adultery; or of rape; or of sodomy; or of adultery coupled with gross cruelty; or of adultery coupled with desertion without reasonable excuse for two years. The husband may obtain a divorce on the ground of the wife's adultery. But neither party can obtain a divorce on the ground of mere desertion alone, however long continued. The court may order the husband to pay a divorced wife a certain sum for her maintenance during their joint lives. A decree of divorce does not come into full force until six months after it is pronounced. The bars to a divorce are condonation, connivance, or collusion. When divorced, the parties are at liberty to marry with third parties. When the divorce is on the ground of adultery, both parties may be examined as witnesses.

In Scotland, divorce may be obtained on the ground of adultery or wilful desertion. Immediately after the reformation, the courts in Scotland recognized the right of either spouse to obtain a divorce on the ground of adultery. And in 1573, a statute was passed declaring that, in case either husband or wife should desert without due cause for four years, the injured party might raise an action of adherence, and, in case redress was not obtained, a decree of divorce might be pronounced. In Scotland, it is not permitted that a marriage should take place between the offending parties through whose action the divorce has come. The effect of a decree of divorce on the pecuniary interests of the parties, is to cause the offender to forfeit all benefit which might accrue to him or her from the marriage. Separation *a mensâ et thoro* also may be obtained in Scotland on the ground of ill-usage, and perhaps desertion (q.v.). Condonation and collusion, but not recrimination, are, in Scotland, a bar to obtaining a dissolution of marriage on the ground of adultery.

Judicial separation, as the separation *a mensâ et thoro* is now called, is not counted as divorce. The parties separated by this decree cannot marry again while both are living. Usually, in regard to property each party is declared to have an independent right to whatever is actually possessed or may be acquired by each respectively.

From the conflict of laws in various countries on the subject of divorce, questions have frequently arisen as to the competency of a sentence of divorce by a tribunal having power according to the *lex loci* to pronounce such sentence, to annul a marriage contracted in a country where such divorce is not allowed. It appears now to be the generally received opinion, that wherever parties are domiciled they will be allowed to avail themselves of the laws of this domicile. But the courts will not recognize a transient visit to a foreign country as sufficient ground to sustain a divorce. On the subject of divorce, see Paterson's *Compendium of English and Scotch Law*, Fraser's *Personal and Domestic Relations*, and Swabey *On the Divorce and Matrimonial Act*. In the United States, S. C. is the only state which has no divorce laws, and the only ground for divorce common to all the other states and territories is adultery. In all other respects there is no uniformity in divorce laws, nor in the status of divorced persons desirous of remarrying. The diversity of divorce laws has led to so much legal complication and human misery, that the pulpit, bar, and press have been pleading for many years for the enactment by congress of a general code of laws that would be operative in every state alike. Divorced persons have no restrictions on remarrying in Ariz., Conn., Ky., Ill., and Minn.; but no person divorced for violation of the marriage vow can marry the *particeps criminis* during the life of the former husband or wife in Del., Penn., and Tenn., nor at any time in La. In Mass., either party may remarry, but the defendant in the divorce suit must

wait two years, and then only on obtaining permission from the court; and in Me. either party may remarry on obtaining similar permission. N. Y., which grants divorce only for adultery, allows the plaintiff to remarry, but prohibits the defendant from doing so during the plaintiff's lifetime, excepting under conditions satisfactory to the court. The duration of local residence which entitles a person to institute suit for divorce ranges from 90 days in Dak. to six months in Ariz., Cal., Ind., Ida., Neb., Nev., N. M., Tex., and Wyo.; 1 year in Ala., Ark., Colo., Ill., Ia., Kan., Ky., Me., Miss., Minn., Mo., Mont., N. H., O., Or., Penn., R. I., Utah, Vt. (applies to both parties), W. Va., Wash., and Wis.; 2 years in Fla., Md., Mich., N. C., and Tenn., and 3 years in Conn. and Mass., if both parties were residents when married, otherwise 5 years. Among the causes for which divorce is granted are *wilful desertion*, which must be 6 months in duration in Ariz.; 1 year in Ark., Cal., Colo., Dak., Fla., Ida., Kan., Ky., Mo., Mont., Nev., Or., Utah, Wis., Wash., and Wyo.; 2 years in Ala., D. C., Ill., Ind., Ia., Mich., Miss., Neb., Penn., and Tenn.; 3 years in Conn., Del., Ga., Me., Md., Mass., Minn., N. H., N. J., O., Tex., Vt., and W. Va.; and 5 years in Va. and R. I.; *habitual drunkenness*, in all states and territories excepting Md., N. J., N. Y., N. C., Penn., S. C., Tex., Vt., Va., and W. Va.; *failure of husband to provide*, in Ariz. (6 months), Cal., Colo., Dak., Nev., and Wyo. (1 year); Ind. and Ida. (2 years); Del. (wilful neglect 3 years), and Mass., Mich., Me., Neb., N. M., R. I., Vt., and Wis. (no time specified); *absence without being heard from*, in N. H. (3 years); Conn. and Vt. (7); Ky. (5 years' separation), Wis. and Ky. (voluntary separation 5 years), and R. I. (when presumed dead by a court); *cruel and abusive treatment*, in various grades, in all the states and territories excepting N. J., N. Y., N. C., S. C., Va., and W. Va.; *imprisonment for or conviction of felony*, in all the states and territories excepting Fla., Me., Md., N. J., N. M., N. Y., and S. C.; *fraudulent representations in contract*, in Ariz., Conn., Ga., Ida., Kan., Ky., O., Penn., and Wash.; *attempt to murder the other party*, in Ill. and Tenn.; and *ungovernable temper*, and various actions arising therefrom, in Ark., Fla., Ky., La., Mo., Or., Penn., Tenn., Wash., and Wis. Besides these causes various specific ones are recognized in several states as constituting sufficient reason for divorce. Among these may be mentioned 'fugitive from justice'; 'any gross neglect of duty'; 'attempt on life'; 'refusal of wife to remove into the state'; 'mental incapacity at time of marriage'; 'joining any religious sect that believes marriage unlawful, and refusing to cohabit six months'; 'failure of parties to live in peace and union'; 'insanity for five years'; 'vagrancy of the husband'; 'settled aversion, which tends to permanently destroy all peace and happiness'; 'imprisonment for life of either party'; 'ungovernable temper'; and 'burdensome indignities.' A divorce leaves all the rights of property as between husband and wife the same as be-

fore it was granted; but it puts an end to all rights depending on the marriage, as dower in the wife and rights of the husband in the real-estate of the wife. The allowance which a court orders a husband to pay to his wife, living separate from him, may be for her maintenance during the pendency of the suit, or permanently after its settlement. See ALIMONY. The custody of the children of divorced couples is generally determined by the court. Under ordinary circumstances, preference is given the claims of the father, but if the child is so young as to require a mother's care, its custody may be awarded her, or if the mother be an improper person, to a third party. The civil law provides that the children shall be brought up by the innocent party at the expense of the guilty. Connivance, collusion, and condonation of offense are bars to the remedy sought in a suit for divorce, and are frequently alleged by the defendant in his or her plea. Another common defense is recrimination, where the defendant charges on the complainant a like guilt with the one complained of; but as it is incompetent for one of the parties to go into court and complain of the other's violation of marital duties if the complaining party is guilty likewise, the object is frequently sought in a counter-suit.

DIVULGE, v. *dĭ-vŭlj'* [F. *divulguer*, to publish—from *divulgārĕ*, to spread among the people—from *dis*, asunder; *vulgo*, I make public: It. *divolgare*]: to make public; to tell something formerly secret or unknown; to disclose; to reveal. DIVUL'GING, imp. DIVULGED', pp. *-vŭljd'*. DIVUL'GER, n. *-vŭl'jĕr*, one who; also DIVULGATER, n. *dĭv'-ŭl-gāt'ĕr*.—SYN. of 'divulge': to discover; uncover; tell; publish; communicate; impart; proclaim.

DIVULSION, n. *dĭ-vŭl'shŭn* [F. *divulsion*, a violent separation—from L. *divulsĭōnem*, a plucking asunder—from *dis*, asunder; *vulsus*, pulled or torn away. It. *divulsione*]: the act of rending asunder or plucking away. DIVUL'SIVE, a. *-sĭv*, that rends or pulls asunder.

DIX, BEULAH MARIE, American novelist: b. Massachusetts 1876. She has published: *Hugh Gwyeth* (1899); *Soldier Rigdale* (1899); *The Making of Christopher Ferringham* (1901); *The Beau's Comedy* (with C. A. Harper, 1902); *A Little Captive Lad* (1902); *Blount of Breckenhow* (1903).

DIX, *dĭks*, DOROTHEA LYNDE, 1805–1887, July 19: b. Worcester, Mass.: philanthropist. She received a liberal education, and taught school in Boston. On inheriting a considerable fortune she began her great work for the amelioration of suffering humanity, 1830. Her first labors were in the Mass. State Prison, Charlestown, where she established a school and taught four years. Anxious for a sphere possessing greater claims to practical reform, she went abroad, and during 1834–38 made a thorough study of the methods of treatment there employed for the pauper, insane, and criminal classes. On her return she started on an inspecting tour of the various prisons and poor-houses in the United States, studying particularly

the accommodations and treatment of the insane, and suggesting radical improvements in public addresses and the newspaper press. She appealed in person before one legislature after another in behalf of a separate detention and a scientific course of treatment of the insane, and to her efforts more than to those of any other person are due the existence of the grand asylums for that class of unfortunates in every part of the country. During the war against secession she held the office of supt. of female nurses by appointment of the sec. of war. and rendered invaluable service. At its close she resumed her mission among the insane, lived with them and died among them in the N. J. State Asylum at Trenton. Her entire fortune was applied to this grand object and she never accepted from any source a cent of pay for services or expenses.

DIX, Edwin Asa, American author: b. Newark, N. J., 1860, June 25. He was graduated from Princeton University in 1881; studied law at Columbia College Law School; and was admitted to the bar in 1884. He served as literary editor of *The Churchman* for a time, and is the author of *A Midsummer Drive Through the Pyrenees; Deacon Bradbury;* a novel; *Champlain, The Founder of New France;* and many short stories, sketches, and travels.

DIX, John Adams, ll.d.: 1798, July 24—1879. Apr. 21; b. Boscawen, N. H.: soldier and statesman. He received a collegiate education, entered the U. S. army as cadet 1812, served with his father, Maj. Timothy Dix, of the 14th inf., was promoted ensign 1813, and took part in the operations on the Canadian frontier. He was promoted 2d lieut. 1814, appointed adj. to Col. J. De B. Walback same year, and aide-de-camp to Gen. Jacob Brown, commander of the n. milit. dept., 1819, and while stationed at Brownsville studied law, and was subsequently admitted to the bar at Washington. In 1826 he was sent on a confidential mission to Denmark, and soon after his return and while holding the rank of capt. was compelled by ill-health to resign from the army. He began the practice of law in Cooperstown, N. Y., 1828; was appointed adj.gen. of the state 1830, and sec. of state and supt. of public schools 1833, and removed to Albany. In 1841 he was elected a member of the assembly, 1841–43 was editor-in-chief of *The Northern Light*, a literary and scientific journal, 1845–49 was a U. S. senator, elected as a democrat, 1848 was defeated as the free-soil democratic candidate for gov., and became asst. U. S. treas. at New York under Pres. Pierce. During the first three months of 1861, at the outbreak of the rebellion, he was sec. of the U. S. treas., and as such telegraphed an order to New Orleans closing with the memorable words, 'If any one attempts to haul down the American flag, shoot him on the spot.' He was the first pres. of the Union Defense Committee of New York, organized and sent to the field 17 regts. on the first call for troops, was appointed one of the four maj. gens. to command the N. Y. state forces, and was commissioned maj gen. of vols. 1861, June. In 1862 he was

assigned to the command of Fortress Monroe; 1863 took charge of the dept. of the e., with headquarters at New York, and served there till the close of the war; 1866 was appointed naval officer at the port of New York, and the same year U. S. minister to France; 1872 was elected gov. of New York as a Republican; and 1874, defeated for re-election. Besides his public offices he was at times comtroller of Trinity Church corporation, deputy to the gen. convention of the Prot. Episc. Church; president of the Miss. and Mo. railway company; first pres. of the Union Pacific railway company; and president of the Erie railway company.

DIX, Morgan, S.T.D., D.C.L.: eldest son of Gen. John A. Dix; b. New York, 1827, Nov. 1; rector of Trinity (Prot. Episc.) Church. He graduated at Columbia College 1848, and the Genl. Theol. Seminary of the Prot. Episc. Church 1852, was ordained deacon the latter year, and priest 1853, was appointed asst. minister in Trinity parish 1855, chosen asst. rector 1859, and rector 1862. He is president of the standing committee of the diocese of New York, vice-pres. of the New York Prot. Episc. public school, trustee of the principal educational and charitable institutions of the denomination, and executor of several estates and private trusts. In 1886 he was president of the house of delegates at the gen. convention of the Prot. Episc. Church. He has published several vols. of sermons and manuals of devotion, beside *Commentary on the Epistle to the Romans* (1864), *Exposition of the Epistles to the Galatians and Colossians* (1866), *Lectures on the Pantheistic Idea of an Impersonal-Substance Deity, as contrasted with the Christian Faith concerning Almighty God* (1865), *Lectures on the Two Estates: that of the Wedded in the Lord, and that of the Single for the Kingdom of Heaven's Sake* (1872), and *Memoir of John A. Dix* (1883). He received the degree of S.T.D. from Columbia College 1862, and D.C.L. from the Univ. of the South 1885.

DIXIE, Lady Florence Caroline Douglas, English explorer, poet, and novelist: b. London 1857, May 24; d. 1905, Nov. 7. She explored Patagonia 1878–9, was war correspondent for the London *Morning Post* in the Boer war 1880–1, and was instrumental in securing the liberty of Cetawayo, king of Zululand. She published: *The Songs of a Child and Other Poems; Across Patagonia; In the Land of Misfortune; A Defence of Zululand and Its 'King;' The Child Hunters of Patagonia; Aniwee or the Warrior Queen; Gloriana; Redeemed in Blood; Little Cherie; Ijain, or the Evolution of a Mind; Isola,* a drama; *Two Castaways;* etc.

DIXON: city, county seat of Lee co., Ills., on both sides of Rock river, 89 m. w. of Chicago, on the Illinois Central and the Chicago and Northwestern railroads. It has several churches, good schools, weekly papers, national banks. The city has gas and water works. It is the seat of North Illinois College. Pop. (1910) 7,216.

DIXON, Frank Haigh, American educator: b. Winona, Minn., 1869, Oct. 8. He was graduated at the University

of Michigan 1892, and has been assistant professor of economics in Dartmouth College since 1898, and secretary of the Amos Tuck School of Administration and Finance since 1900. He has published *State Railroad Control.*

DIXON, James, American lawyer and statesman: b. Enfield, Conn., 1814, Aug. 5; d. Hartford, Conn., 1873, Mar. 27. He was graduated at Williams College, and achieved distinction in the practice of the law, but turning his attention to public affairs, was repeatedly elected to the Connecticut legislature as a Whig, served two terms in the United States House of Representatives, and was a member of the United States Senate from 1857 to 1869.

DIXON, James Main, American educator: b. Paisley, Scotland, 1856, Apr. 20. He was educated at the University of St. Andrews, was professor of English in the Imperial College of Engineering, Japan, 1879–86; professor of English in the Imperial University of Japan 1886–92, and professor of English literature in Washington University 1892–1901. He has published *A Dictionary of Idiomatic English Phrases* (1891), and is joint author of an *Illustrated History of Methodism* (1900).

DIXON, Joseph, American inventor: b. 1799; d. 1869. He was at various times shoemaker, printer, wood engraver and physician, and establishing crucible works in 1827 at Salem, Mass., became very wealthy. In the course of his experiments he devised important improvements in philography, smelting, banknote printing, etc.

DIXON, Richard Watson, English clergyman and author: b. London, 1833; d. 1906, Jan. 2. He was educated at Oxford; was master in the high school at Carlisle in 1863, and canon of Carlisle in 1874. He became vicar of Hayton in 1873 and of Warkworth in 1883. He published: *Christ's Company and other Poems* (1861); *Historical Odes and other Poems* (1864); *Mano, a Poetical History* (1883); *Odes and Eclogues* (1884); *Lyrical Poems* (1885); *The Story of Eudocia and Her Brothers, a Narrative Poem* (1887); *Songs and Odes* (1896); *Essay on the Maintenance of the Church of England* (1875); *Life of James Dixon* (1874), and *History of the Church of England from the Abolition of the Roman Jurisdiction* (1880–1900). He was associated with Burne-Jones, Rossetti, and Morris, in founding the *Oxford and Cambridge Magazine*, the chief organ of the pre-Raphaelite school.

DIXON, Thomas, Jr., American novelist and clergyman: b. Shelby, N. C., 1864, Jan. 11. He was graduated at Wake Forest College, N. C., 1883, and Greensboro, N. C., law school 1886, and admitted to the bar in the last-named year. After serving from 1884–86 as member of the legislature in North Carolina he resigned to enter the Baptist ministry. He was pastor in Raleigh, N. C., 1887; Boston, Mass., 1888–9, and New York 1889–99. Among his works are: *Living Problems in Religion and Social Science* (1891); *What is Religion?* (1892); *Sermons on Ingersoll* (1894); *The Leopard's Spots* (1902); *The One*

Woman (1903); *The Clansman* (1904); *The Life Worth Living* (1905).

DIXON, *dĭks'n*, WILLIAM HEPWORTH: 1821–1879, Dec. 27; b. in the West Riding of Yorkshire: English author. He settled in London 1846, where he soon acquired reputation by his writings. A series of papers, in the *Daily News*, 'On the Literature of the Lower Orders,' and another on 'London Prisons,' attracted attention. The latter reappeared in a volume 1850. Before this, but in the same year, he published *John Howard, and the Prison World of Europe*. It was with difficulty that he could induce a publisher to accept it, yet when published, it went through three editions in one year. Dixon now devoted himself principally to historical biography. In 1851, appeared the first edition of *William Penn*, in which Dixon undertook to disprove Macaulay's charges against the eminent Quaker. In 1852, was published *Life of Blake;* and in the same year an anonymous pamphlet, entitled *The French in England*, designed to allay the fear of a French invasion. In 1853, Dixon was appointed editor of the *Athenæum*, which position he held for 16 years. In 1860, he published *Life of Lord Bacon*, and in 1863, *The Holy Land*. He gave the public *New America* in 1867; *Spiritual Wives* in 1868; *Free Russia* in 1870; *The Switzers* in 1872; *History of Two Queens* in 1873–4; *White Conquest* in 1875; and *British Cyprus* in 1879. *Her Majesty's Tower* (4 vols.), begun 1870, was followed by *Royal Windsor*. *Diana Lady Lyle* (1877) and *Ruby Grey* (1878) were novels.

DIX'ON ENTRANCE: strait on the w. coast of the Dominion of Canada, separates Queen Charlotte Island from the Prince of Wales Archipelago, and so divides British territory from a part of the U. S. domains.

DIXWELL, *dĭks'wĕl*, JOHN: 1607–1689, Mar. 18; b. Folkestone, England: one of the regicides. He was descended from a prominent Kentish family and was a man of estate; became a col. in the army under Cromwell, a member of four parliaments and three councils, and of the high court which condemned Charles I. He was condemned to death with his associates after the restoration, but escaped to America and settled in New Haven, changed his name to John Davids, and raised a family. Two of his fellow regicides, Whalley and Goff, found a refuge at Hadley, Mass., about the same time.

DIZEN, v. *dĭz'n* or *dī'zn* [from the same root as *distaff*]: to prepare flax on a distaff for spinning; to dress; to dress or deck out gaudily.

DIZFUL, *dĭz-fôl':* town of Persia, on the river Dizful; lat. 32° 10′ n., and long. 48° 34′ e. It is cap. and principal mart of its province (Khuzistan). A handsome bridge of 20 arches crosses the river here. The foundation is of stone and of ancient date, the upper portions are of brick and are modern. Pop. estimated 15,000.

DIZIER, ST., *săng dē-ze-ā':* town of France, dept. of Haute-Marne, 10 m. n. of Vassy; on the Marne, which

here begins to be navigable. It is very long and narrow, but well-built, the streets being wide, clean, and regular. In 1544, Dizier resisted for a month the assaults of a Spanish army under Ferdinand de Gonzaga; a resistance of the greatest consequence to the French ruler, Francis I., the delay enabling him to collect his forces to oppose the march of the Spaniards upon Paris. In 1814, the French twice defeated here the invading army of the allies. The chief industrial features of the place are iron forges and foundries, boat-building yards, in which a great number of river and canal boats, generally of about 100 tons, are constructed, and cotton factories. There is also considerable trade in wood, iron, and grain. Pop. 13,372.

DIZZY, a. *dĭz′zĭ* [AS. *dysig*, foolish: Low Ger. *düsig*, giddy, dizzy: Dan. *disig*. hazy]: having a sensation of swimming or whirling in the head, with a tendency to fall; causing giddiness; giddy; thoughtless: V. to make giddy; to confuse. Diz′zying, imp. *-zĭ-ĭng*. Dizzied, pp. *-zĭd*. Diz′zily, ad. *-lĭ*. Diz′ziness, n. the sensation of swimming in the head; giddiness.

DIZZINESS. This is a mental state of confusion and disturbed equilibrium which may be produced by certain forms of movement of the body, by presence on high places and by organic disorders, especially those of the semicircular canals of the ear. It is a complex of unusual and often opposing sensations and after-sensations of movement. Swinging and whirling motions, rocking movements, rapid ascents and descents, rotations, more or less long continued, or any combination of these, are effective in producing the state in persons susceptible to it. People differ very greatly in their susceptibility and in the readiness with which they become habituated, for instance, on long journeys at sea. The state is usually felt as an after-effect of the movement, although on board ship, where one cannot escape the rolling motion, it comes on with the movement and persists often for days or perhaps as long as the motion continues. It is generally accompanied by a feeling of nausea and by vomiting and in severe cases, eye nystagmus, fever, loss of appetite, great bodily weakness and depression may follow. Sea-sickness, car-sickness and the dizziness of high places are some of its most common forms. It is most easily and ordinarily induced by rotating rapidly about the vertical axis of the body, as on the heel. Dizziness may be induced also by galvanic stimulation of the skull, that is, passing a galvanic current through the skull from side to side. The chief factor in the state itself is a feeling of lost equilibrium; the dizzy person, though in a resting position, feels various illusory movements that are conflicting in direction. To these he makes reflexly attempts at adjustment and so throws himself, if he be standing up, out of balance and falls to the ground. The felt motions are in part after-sensations of the previous movements and in part they are due to the eye nystagmus which is always present in dizziness after rotations about the vertical axis and in galvanic

dizziness. Apparently any unusual brain excitement or stimulation may give rise to feelings of dizziness. Many forms of bodily ailments, especially disordered conditions of the stomach and liver and imperfect coördinations of the eyes, are accompanied by feelings of dizziness.

DJERRID, or JERRID, n. *jĕr-rēd′* [Ar. *jarid*, a leafless palm-branch, a lance]: a Turkish javelin.

DJEZZAR, *jĕz′zar*, i.e., *Butcher:* name given to Achmed Pasha, the cruel governor of Acre: abt. 1735–1804; b. Bosnia. He rose through murder and treason, from the condition of a slave to the pashalic of Acre. In the beginning of 1799, the French entered Syria from Egypt, and advanced from victory to victory till they reached Acre, which they besieged, Mar. 20. By the advice of Colonel Philippeaux, a French émigré, and of Sir Sydney Smith, the commander of the British fleet in the Levant, Djezzar was induced to hold out; and such was the savage doggedness of his resolution, that Bonaparte was obliged to retire May 21. It is said that during the siege he sat on the floor of his palace surrounded by a heap of gory skulls, distributing money to all who brought in the heads of Frenchmen. He died at Acre. Djezzar was at times maniacal in his cruelties. He took off the heads of his wives without the slightest ceremony—seven at a time. But he had also moments of remorseful tenderness, in which he helped the poor and provided for those that he had injured. He is said to have possessed sharp discernment.

DMITROV, *d′mē-trŏv′;* ancient town of Russia, on the Jakhrama, an affluent to the Volga, 40 m. n. of Moscow. It covers a large area, a considerable part of which is occupied by gardens, but as a whole is poorly built. It contains a college and seven churches, and has manufactures of silk and cotton goods, tanneries, etc. Pop. 9,206.

DNIEPER, *nē′pĕr:* one of the large rivers of Europe; has its source in swampy forest-lands in the n. of the Russian govt. of Smolensk. Its general direction, till it reaches Kiev, is south. From Kiev, its course is s.e. to Ekaterinoslav, where it turns directly s. past Alexandrovsk, below which town it sweeps to the s.w., and pursues that direction until it debouches in the Black Sea, between the govts. of Kherson and Taurida, its embouchure forming a gulf of about 50 m. in length, with a breadth of from 1 to 6 m. Its principal affluents are the Desna and Soj from the east, and the Pripet, the Beresina, and the Druz from the west. The total length of the Dnieper is upward of 1,000 m., and it is navigable almost from its source, its breadth at Dorogobush, about 50 m. below its source, being 210 ft. Some of the finest govts. of the Russian empire lie within its basin, with all of which its navigable branches and canals give it communication. In its upper part, it flows through a marshy forest territory; its middle and lower course is rocky. Below Ekaterinoslav, there are no less than 13 rapids in about 40 miles; but these impediments

to navigation have been overcome in part by blasting, and by great hydraulic-works erected by the Russian government. The produce of the provinces, consisting mostly of corn, timber, iron, salt, hemp, and linen, are usually conveyed down the river to ports on the Black Sea, but many vessels pass annually from the Dnieper to the Baltic by the Beresina and the Dwina. At Smolensk, the waters of the Dnieper are frozen from Nov. to Apr.; at Kiev, they are ice-bound only from Jan. to Mar. Sturgeon, carp, and pike abound in the river. As the *Borysthenes* the river was known in the 7th c. before Christ to the Greeks, who regarded it as the most valuable river on earth next to the Nile.

DNIES'TER, *nēs'tėr:* river of Europe, flowing chiefly through Russia, but having its rise in the Carpathian Mountains, in the Austrian crown-land of Galicia about lat. 49° 10′ n., long. 23° e. Its general course, until it reaches the Russian territory, is s.e.; it then runs e. for a short distance, and thence s.s.e., forming the boundary between Bessarabia Kherson, past Mohilev, Dubossari, and Bender, to the Black Sea, which it enters by a shallow shore lake, 19 m. in length and 5 in breadth, between Ackerman and Ovidiopol. The total length of the Dniester is between 500 and 600 m., its current throughout being very rapid. Until it reaches the Russian frontier, its right bank is skirted by offsets from the Carpathians; but at that point, the country, which above has been level on only one side, opens into a broad flat plain, through which the river, broken at intervals by masses of rock, rushes muddy and turbid. The downward navigation is interrupted by a series of falls and whirlpools. Wood and grain are the chief products conveyed down the river.

DO, v. *dô* [AS. *don;* Dut. *doen*, to do: AS. *dugan*, to profit, to avail: comp. Gael. *dean*, to do, to make, to perform]: to act, to practice; to perform; to achieve; to succeed; to fulfil a purpose; to finish or end, as, 'I have *done* with the book'; to cease to be concerned, as, 'I have *done* with him'; in *Scrip.*, to make, as, 'we *do* you to wit,' that is, 'we make you to know'; to put into the form of, as, '*done* into verse'; to fare; to be in a state in regard to health. Do'ing, imp. Did, pt. *dĭd*. Done, pp. *dŭn*, finished. Doest, *dô'ĕst*, or Dost, *dŭst*, 2d sing. pres. tense. Does, *dŭz*, or Doth, *dŭth*, 3d sing. pres. tense. This will do, this will answer the purpose. How do you do? how are you in health? how do you get on?—usually a mere salutation of respect. Done up, ruined. Done with, finished; completed. To do with, to make use of; to employ. To do away, to remove; to destroy. To do up, to envelop; to pack up. To do with, to dispose of, to employ. To do for, to answer for; to suit; *colloquially*, to baffle completely; to ruin. To do without to be able to dispense with; to get along without. Do is used along with a verb to render it emphatic, as, 'I *do* love.'

Note 1.—Do in the imperative expresses vehement command, earnest request, as, '*do* help me'; 'make haste, *do.*'

Note 2.—Do [AS. *dugan*, to be worth: prov. Eng. *dow*, to avail, to suit]: to succeed, to fulfil a purpose, to fare, is really different from the word Do, to act, to perform. As will be observed, they are from different roots, but their significations are so intermingled that it appears impracticable to group them under their separate heads.

DO, n. *dō:* in *music*, the name for the first or C note in the scale; the key-note: *do* was formerly named *ut.*

Do, v. *dô:* [a slang colloquial word]: to cheat: N. a. cheat; an imposture.

DO, pronounced as if written *dĭt'tō:* an abbreviation of DITTO, which see.

DOAK, SAMUEL, American Presbyterian clergyman: b. Augusta co., Va., 1749, Aug. 1; d. Bethel, N. C., 1830, Dec. 12. He was graduated from Princeton; was for a time tutor in Hampton Sidney College; and was licensed to preach in 1777. He first settled at Holston, and later at Salem, Tenn., where he built a small church, formed the Salem congregation, and established a school, the first organized in the Mississippi valley. It was incorporated in 1785 as Martin Academy, and in 1795 became Washington College; DOAK was its president from 1795 to 1818. He then removed to Bethel, where he founded Tusculum Academy.

DOANE, GEORGE HOBART, American Roman Catholic clergyman: b. Boston, Mass., 1830, Sep. 5; d. Newark, N. J., 1905, Jan. 20. He was graduated at Jefferson Medical College in 1850, became a deacon in the Protestant Episcopal Church, but later entered the Roman Catholic Church and was ordained priest in 1857. In 1873 he was made vicar-general of Newark, N. J., and in 1886 the Pope made him a domestic prelate with the title of Monsignore. He wrote: *First Principles; Exclusion of Protestant Worship from Rome;* etc.

DOANE, GEORGE WASHINGTON, American Episcopal bishop: b. Trenton, N. J., 1799, May 27; d. Burlington, N. J., 1859, April 27. He was educated at Union College, and was one of the first six students at the General Theological Seminary in New York. He was ordained deacon in 1821 and priest two years later, having become in the meantime an assistant in Trinity Parish, New York. Here he remained until 1825, when he was appointed professor of rhetoric and belles-lettres in Washington (now Trinity) College, Hartford. This position he held for three years, going then to Boston as assistant and afterward rector of Trinity Church. In 1832 he was consecrated bishop of New Jersey, and took up his residence in Burlington, N. J., combining the rectorship of St. Mary's Church with the episcopate until his death. He devoted himself especially to the promotion of Christian education. In 1837 he founded St. Mary's Hall, a boarding and day school for girls, at Burlington, and in 1846 organized

Burlington College in the same town. His zeal in this direction, combined with incomplete knowledge of business principles, led to financial embarrassment and ultimately to presentment for trial before his brother bishops; but the charge was unanimously dismissed. He left a large number of published sermons, lectures, and essays, and was also a poet of no mean ability, his best-known poem being that beginning *What is That, Mother?*

DOANE, The Right-Reverend William Croswell, Bishop of Albany in the Prot. Epis. Ch. of America: b. Boston, 1832, Mar. 2. Graduated from Burlington, N. J., College, 1850, A.M.; also LLD., Union, and Cambridge, Eng.; and D.D., Columbia, Hobart, and Trinity (Conn.), Oxford, Eng., and Dublin Univ., Ireland; ordained priest, 1856, and was for some time assistant to his father (Bishop G. W. Doane) and afterward rector at St. Mary's ch., Burlington, but subsequently founded and became rector of St. Barnabas' ch., at the same place; in 1861, he went to Hartford, Conn., and was rector of St. John's ch. in that city until 1867, when he removed to Albany and became rector of St. Peter's ch. On the division of the diocese of New York in 1869, he was elected first Bishop of Albany, a position which he still retains. He is a firm believer in the cathedral system, and has given much time and talent to its organization, especially at Albany, where mainly through his personal efforts a splendid cathedral has been erected. He founded St. Agnes' School, the Sisterhood of the Holy Child, the Child's Hospital, and St. Margaret's Home for Babies at Albany, and was prominent in the second, third and fourth Lambeth Conferences, besides taking a leading part in the discussions on the revision of the American Prayer-Book, to which he made a number of valuable contributions; he has likewise upheld the dignity of Christian citizenship by his influence in legislation upon social and moral questions, and in other respects has lived a useful life, filled with good works. As an author his reputation rests mainly on his *Life of Bishop G. W. Doane*, but he has published a number of sermons, addresses, and poems, chiefly on religious subjects, and *Mosaics, or the Harmony of the Collects, Epistles, and Gospels*, and *The Manifestations of the Risen Lord.*

DOBELL, *do-bĕl'*, SYDNEY: 1824–74; b. London: modern English poet. His father, a wine-merchant, removed to Cheltenham 1835. Here Dobell, whose education was entirely private, lived till 1850; when the *Roman* was published, and received with favor by the literary world. Dobell resided some time in Switzerland, and then in Edinburgh till 1857. He afterward resided on the Cotswold Hills, near Gloucester. Beside the *Roman*, Dobell published *Balder* (1854), *Sonnets on the War*, in conjunction with Mr. A. Smith (1855), and *England in Time of War* (1856). His poems have a singular mixture of the philosophical and the poetical spirit. Many of his passages are as spiritual in conception and lavish in imagery as the finest portions of Shelley; others are as obscure, intricate,

and involved as the rhymed enigmas of Cowley or Donne. In 1865, Dobell published a political pamphlet advocating a graduated suffrage and plurality of votes; and in 1871, *England's Day*, a lyric. A collected edition of his poems was published 1875; and in 1876, *Thoughts on Art, Philosophy, and Religion*. See *Life and Letters of Sydney Dobell* (1878).

DÖBELN, *dö'bĕln:* town of Saxony, 36 m. s.e. of Leipsic, on an island formed by the Mulde. It is well built, and contains a richly endowed hospital. Its chief manufactures are linen, woolen, and cotton cloth, brassware, and hats. Döbeln has also several bleach-fields and worsted-mills. Pop. 13,892.

DOBRIZHOFFER, *dō'brĭts-hōf-ĕr*, MARTIN, a Jesuit missionary to the native tribes of Paraguay and author of a voluminous and celebrated memoir on the Abipones, a Paraguayan tribe: b. Gratz, Syria, 1717; d. Vienna, 1791, July 17. At the age of 19 he entered the Jesuit order and in 1749, having been ordained priest, was assigned to the mission of Paraguay, in which he spent 18 years, returning then to Austria where he passed the remainder of his life, devoting his leisure to writing his memoir *Historia de Abiponibus, etc.*, that is, *A history of the Abipones, a cavalier and warlike people of Paraguay, enriched with copious observations on the barbarous natives, rivers, beasts, amphibia, insects, principal serpents, fishes, birds, trees, plants, and peculiarities of the said province*. A translation of the work (somewhat abridged) by Sara, S. T. Coleridge's daughter, was published in three large volumes (1822). Southey, in his *Tale of Paraguay*, in complimenting Miss Coleridge upon the faithfulness of her translation of so voluminous a work, and one so full of difficulties for the translator, alludes to the Empress Maria Theresa's generous protection of the author after he and his order had been expelled by the Spanish government from South America and after the order had itself been suppressed by the Pope:

> And if he could in Merlin's glass have seen
> By whom his tomes to speak our tongue were taught,
> The old man would have felt as pleased, I ween,
> As when he won the ear of that Great Empress Queen.

DOBROWSKI, *do-brŏv'skē*, JOSEPH: founder of Slavic philology: 1753, Aug. 17—1829, Jan. 6; b. Gyermet, near Raab, in Hungary, where his father, a Bohemian by birth, was stationed in garrison. He studied at the gymnasium of Deutschbrot, and at Klattau and Prague. In 1772 he entered the order of the Jesuits at Brünn, but on its dissolution ten months after, he returned to Prague, to continue his theological studies, and in 1776 became tutor in the family of the Count von Nostitz. During 1780–87, he edited a critical journal of Bohemian and Moravian literature. This soon involved him in various strifes, and ultimately the review was 'stopped' by the authorities, but not before it had added largely to Dobrowski's reputation. In 1792, at the expense of the Royal Bohemian Scientific Soc., he made a journey to Denmark, Sweden,

and R ssia, to search after the fate of those Bohemian books and MSS. which the Swedes had carried off from Prague during the Thirty Years' War. Two years later, he traveled through Germany, Italy, and Switzerland. On his return, he showed symptoms of a disordered mind, and in 1801 had to be confined for some time. He speedily recovered, but was subject to intermittent fits of insanity until his death. Dobrowski is reckoned one of the highest, if not the very highest, authority on Bohemian history and literature. His principal productions are—*Scriptores rerum Bohemicarum* (Prag. 2 vols. 1783–4); *Geschichte der Böhm. Sprache und ältern Literatur* (Prag. 1792); *Die Bildsamkeit der Slaw Sprache* (Prag. 1799); *Deutsch-Bôhm. Wörterbuch* (2 vols. Prag. 1802–21), in which he was largely assisted by other eminent Bohemian scholars; *Lehrgebäude der Böhm.-Sprache* (Prag. 1809); and *Institutiones Linguæ Slavonicæ Dialecti Veteris* (Vienna, 1822).

DOBRUDSCHA, or DOBRUDJA, *dō-brôd'shâ* or *dō-brô'jâ* (anciently *Scythia Minor*): region formerly Turkish, now belonging to Roumania; between the lower Danube and the Black Sea; the Berlin Congress of 1878, in transferring it to the principality, fixed the s. limit, formerly somewhat indefinite, at a line from Silistria on the Danube to Mangalia on the sea-coast. The n.e. of this region is occupied by marshes and the delta of the Danube; the rest of the area is partly steppe and partly cultivated corn-land. There is much manufacture of salt. Pop. 200,000.

DOBSON, *dŏb'son*, HENRY AUSTIN: b. Plymouth, England, 1840, Jan. 18: poet. He was educated at Beaumaris, Coventry, and Strasburg, had an early inclination toward civil engineering, but entered the civil service when 16 years old, and has since been connected with the board of trade. He was introduced to the public as a poet by Anthony Trollope in his magazine, *St. Paul's*, 1868; published his first collection of lyrics, *Vignettes in Rhyme, and Vers de Société*, 1873, and followed it with *Proverbs in Porcelain* (1877), and *At the Sign of the Lyre* (1885). A selection from the first two was published in New York 1880, and reprinted in England under the title of *Old-world Idylls* 1883. He has also contributed largely to the *Biographies of Great Artists* (1879); edited for the *Parchment Library* the *Eighteenth Century Essays* (1782), *Gay's Fables* (1882), and *The Vicar of Wakefield* (1883); for the *Clarendon Press, Beaumarchais' Le Barbier de Séville* (1884), and *Selections from Steele* (1885); contributed a study of Bewick, the artist and wood-engraver to the *Century* magazine republished in England under the title of *Thomas Bewick, and his Pupils* (1884); and was author of the *Life of Steele* in the *English Worthies* series (1886); *Goldsmith* (1888); *Walpole* (1890); *Hogarth* (1891); *Richardson* (1902); *Sidewalk Studies* (1902); *Fanny Burney* (1903).

DOB'SON, WILLIAM: 1610–46; b. London: painter. He was a pupil of Robert Peake, became a portrait painter of much merit, and, having won the regard of Vandyck by

his excellent drawing and coloring, was recommended by him to the favor of Charles I. After Vandyck's death he was appointed sergeant-painter to the king. His portraits possessed much dignity, but had very dark face shadows, and resembled in some points those of Lely and Vandyck. He attempted historical painting but did not succeed, and died poor.

DOCE, Rio, *dō'sā:* river rising at base of Mt. Itacolumi, s.e. of Ouro Preto, prov. of Minas Geraes, Brazil, and falling into the Atlantic near Regencia, 60 m. n. of Victoria, after a tortuous course of 500 m. It has a wide, shallow mouth, is difficult of entrance, navigable by small steamers all the year round as far up as Porto de Souza, and beyond only by canoes and for irregular distances on account of the rapids; and is bordered by forests containing many species of valuable woods.

DOCETÆ, *do-sē'tē* [from the Gr. *dokeō*, I appear or seem] in the early church, heretics who held that the human nature of Jesus Christ was a semblance and not a reality. The philosophy of polytheism, as well as of Judaism, has explained the appearances of divinities and of angels by holding that the assumption of bodies was only momentary, or in appearance. And when the Gnostic Christians found it impossible to conceive the essential union of the divine nature with a body of composed matter, since they held matter to be the seat of all evil, they had recourse to the same expedient. The difficulty was met in one of three ways: the body of Christ was either considered a real earthly body, but not belonging essentially to his nature, and only assumed for a time; or it was declared to be a mere appearance or illusion: or, finally, it was believed to be a heavenly body, composed of ethereal substance, though having the appearance of being material. All the Gnostic heretics held Docetism in one or other of these three forms, with the exception of those who were led by the same difficulty to deny the veritable divine nature of Jesus Christ, and reduce him to a mere human sage. Some of these alternative forms of heresy seem to have continued under various names, to the present time, though with no prominent or numerous following. For a clear and learned account of Docetism, consult Neander's *Dogmengeschichte* (History of Doctrine). English by J. E. Ryland; published by H. G. Bohn, 2 vols. 1858.

DOCILE, a. *dŏs'ĭl* or *dō'sīl* [F. *docile*—from L. *docĭlĭs*, easily taught, apt to learn—from *docĕō*, I teach]: easily instructed; teachable; easily managed; tractable. Docility, n. *dō-sĭl'ĭ-tĭ* [F. *docilité*]: readiness to learn; aptness to be taught.

DOCIMACY, n. *dŏs'ĭ-mă-sĭ* [Gr. *dokimăsĭă*, proving, trial—from *dokimāzō*, I try, I put to the proof]: the act or practice of assaying ores or metals. Doc'imas'tic, a. *-măs'-tĭk*, relating to the assaying of ores or metals; proving by experiments. Doc'imol'ogy, n. *-mŏl'ŏ-jĭ* [Gr. *logos*, a discourse]: a treatise on the art of assaying metals, etc.

DOCK, v. *dŏk* [Ger. *docke*, a bundle, a bunch of thread. It. *tocco*, a scrap: W. *toc*, short or abrupt· Icel. *dockr*, a short stumpy tail]: to cut or lop off the end of a thing; to curtail; to shorten: N. the tail of a beast cut short; the solid part of the tail; a term applied to several plants having leaves broad in proportion to their length, as *sour-dock* or *sorrel*, *burdock*—several plants of the genus *Rumex*, ord. *Polygonăcĕæ*. DOCK'ING, imp. DOCKED, pp. *dŏkt*, clipped; cut off, as the end of a thing.

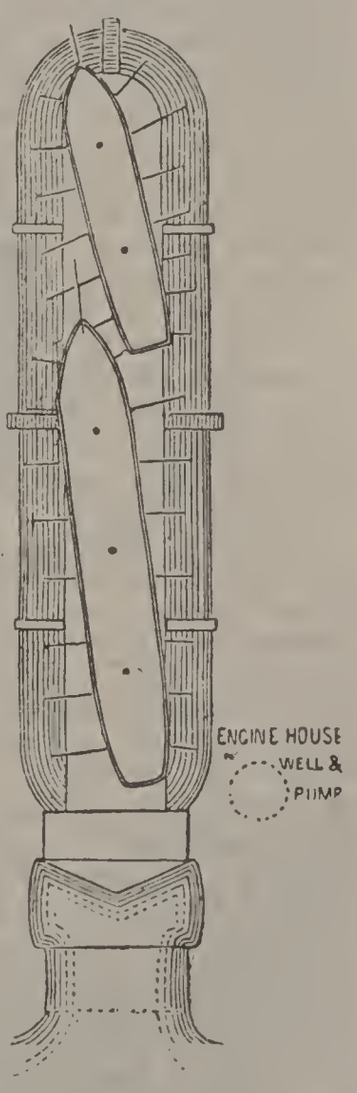
DOCK, n. *dŏk* [Flem. *docke*, a bird-cage: comp. Gael. *tog*, to lift]: the raised inclosure or box in which a criminal is placed at his trial.

DOCK (*Lapathum*): sub-genus of the genus *Rumex*, the other species of which are generally called SORREL (q.v.); containing those which are not acid, and of which the flowers are hermaphrodite. They are large perennial herbaceous plants, natives chiefly of temperate climates, with large generally lanceolate or ovate leaves, and panicles of small greenish flowers. They have great tap-roots, and are with difficulty eradicated from pastures. They also multiply rapidly by seed. The best mode of dealing with them, is generally found to be repeated cutting away of their leaves and shoots, by which the plants are killed. Many of the species prefer watery places. A number are natives of Britain, and several of the European ones have found their way to North America, where they have become troublesome weeds, a number of really indigenous species also being found there. Useless and even troublesome as the D. is generally esteemed, yet the large astringent roots are capable of being beneficially employed in medicine; and those of the great Water D. (*R. hydrolapathum*) in particular—for which the Druids entertained a superstitious veneration—are administered as an antiscorbutic. They are used also in rheumatism, and sometimes as a styptic, sometimes to form an astringent gargle, and sometimes as a dentifrice. *R. alpinus* is called MONK'S RHUBARB, and its root was formerly employed instead of rhubarb, but is less powerful. It is a native of the Alps.—The roots of docks have been sometimes used in dyeing, and give 'a great variety of shades, from straw-color to a pretty fine olive, and a fine deep-green to cloths which have been previously blued.'

DOCK, n. *dŏk* [old Dut. *dokke*, a harbor: Ger *docke*, the tap to let the water of a fish-pond in or out: It. *doccia*, a mill-dam: mid. L. *doga*, a ditch, a canal]: an inclosed basin into which a ship may be lifted or placed for repairs; a large pond at the side of a river, or at its mouth, where the water is kept out by flood-gates till the ship is built or repaired; the water-way extending between two wharves. V. to place in a dock. DOCK'AGE, n. *-āj*, money paid for the use of a dock. DRY DOCK, that from which the water can be run off for the inspection of the bottoms of ships. WET DOCK, one always kept with a sufficient depth of water for the floating of ships. DOCKYARD, n. spaces and warehouses inclosed in a dock for naval stores, timber,

etc.—Docks are of three kinds—wet or floating; tidal, properly called harbors or basins; and dry or graving. Wet Docks are for the purpose of maintaining a level nearly uniform with that of high water, so as to keep vessels always afloat, and to save them from rubbing up and down the quays with the rise and fall of the tide, and being sometimes too high and at other times too low for convenience in shipping or discharging cargoes.

Wet docks are generally surrounded by quay or wharf walls of masonry or brickwork, but where they are wanted chiefly for laying up vessels in, and not for loading or unloading, their margin is sometimes only a natural sloping beach. They are of most importance in places where there is a great rise and fall of tide, as at Bristol or Liverpool, where they are almost indispensable; while in the Clyde, where the tides are small, they have not long been erected, and are on a much more limited scale. Wet docks are generally entered by means of what is called a lock (see Lock), having two gates, in one leaf, or more frequently in two folding-leaves each, which enables vessels to enter or depart for a considerable time before and after high-water; but frequently, for the sake of economy both in space and in cost, they have only one gate, so that vessels can enter or depart only at or very near high-water, unless the water in the dock be run down considerably below that level. In most of the ports of the United States there is little occasion for inclosed docks as the rise and fall of the tides is not sufficient to interfere with the convenience of loading and unloading at the wharves. The constructions here called docks, such as the Atlantic Docks in Brooklyn, are usually large basins, entered at all tides, and provided with all accommodations for loading and unloading great ships. They are properly tidal docks, but with water always sufficient to float any vessels that enter them.



Plan of Dry Dock.

The water in wet docks is sometimes kept, by means of pumping, permanently at as high a level as that of the highest tides, when a supply of pure water can be procured, to prevent the silting caused by the admission of any considerable body of turbid water by the gates, but that involves the necessity of locking up or

down always except at the highest tides. The tendency to silt up by deposits of fine mud is of common occurrence, and dredging, or some other plan, must be resorted to for the purpose of keeping the dock reasonably clear. In almost all cases, wet docks require to be occasionally emptied for the purpose of cleaning.

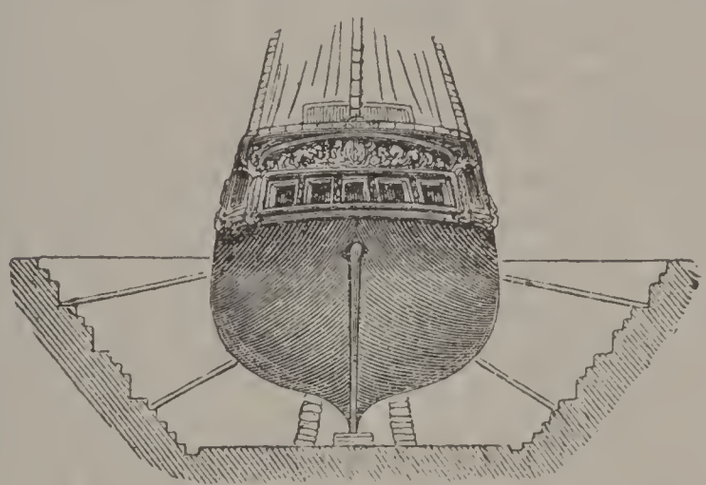
Dock-gates are generally opened and shut by means of chains worked by hand, either by winches or capstans; but of late years they have in many cases been moved by hydraulic machinery, as in England, at Great Grimsby, the Victoria Docks in the Thames, and Albert Dock, Leith.

Tidal docks require no particular description; they are merely basins surrounded by quay walls, and having open entrances permitting the free flow and ebb of the tide, as at Greenock and Troon, and they have the advantage of requiring no opening or shutting of gates. With small tides, they answer very well, and they are sometimes made deep enough to keep vessels afloat at low-water; but with tides of considerable range they are attended with the disadvantage of large vessels grounding at low water, and from the large volume of water, generally more or less turbid, which enters at every tide, they are much more liable to silt up than wet docks are. For ridding them of muddy deposits, the plan is sometimes resorted to of letting out a reserve of water with a sudden gush from an inclosure at the inner end, at the time the tide has receded. This is called scouring. Such is the process pursued at Boulogne and elsewhere.

The quays of wet and of tidal docks must have mooring-ports of rings to which vessels can make fast. They are generally provided with sheds to keep goods dry, with cranes (see HYDRAULIC CRANE) for shipping or unloading heavy articles, and with staiths or drops in the case of coal-shipping ports, and now they very frequently have rails laid along them.

Dry docks are used for the purpose of laying vessels dry for examination or repairs. They may have their entrance either from a wet dock or from a tidal harbor; but the former is much the better arrangement, as it admits of vessels being docked or taken out at any time of tide, and it keeps a more equal pressure on the gates, thereby making them less liable to leak. They require to be built of good water-tight masonry. The entrance has generally a pair of folding-gates pointing outwards, to exclude the water; but sometimes it is closed by means of a caisson—viz., a vessel shaped something like the hull of a small ship, and having a keel and two stems, which fit into a groove in the masonry. The caisson is sunk into the groove by admitting water into its interior, and is floated out again by pumping out the water. When the tides are very large, the bottom of the dock may sometimes be placed above low-water, so that it may be run dry without pumping; but generally the bottom of a dry dock for the reception of any but very small vessels is below that level, in which case a steam-engine and pumps, with a well and water-channels leading to it, are required for emptying the dock.

The floor is nearly level, and the keel of the vessel to be docked rests on wooden blocks fastened down to prevent them floating, and of such a height as to admit of the shipwrights going under the vessel's bottom. Side-shores are put in, to keep the vessel upright, and blocks are fitted in under the bilges as soon as possible after the water has been got out of the dock. The sides generally consist of stone steps called altars, for the purpose of fixing the lower ends of the shores, and also for the convenience of supporting the workmen's scaffolds. Dry docks are frequently made long enough to hold three or four vessels of considerable size at one time, in which case they are placed, not in the centre line of the dock, but obliquely across, to give more available length. One of the finest graving-docks in the world, though not of the largest size, is at the U. S. Navy Yard, Brooklyn. It is of granite and cost over $2,000,000. Its main chamber has a length at top of 307 ft.; breadth 98 ft.; length at bottom, 286 ft.; breadth 30 ft. It can be emptied by steam-pumps in two hours. Floating-docks are mostly used in the United States in the repair of vessels; they are sometimes built in sections.



Section of Dry Dock.

They serve their purpose, and are quite numerous, but lack permanence.

The use of the graving dock is frequently superseded by that of Morton's patent slip: see SLIP. Graving-docks of large dimensions are very expensive works, and the difficulty of making them water-tight is very great. In many cases, therefore, recourse is had to a pontoon or floating dock, sometimes termed a 'camel.' See FLOATING-DOCK. The use of the floating-dock, together with the application of hydraulic pressure for the raising of ships, is to be seen at the 'Thames Graving-Dock,' where there are two rows of cast-iron columns, five ft. diameter, 16 in each row. The rows are 60 ft apart, and the practical working length is 350 ft Each column incloses a hydraulic press of 10 inches diameter, with a length of stroke of 25 ft. There are cross-heads on the top of each ram, from the ends of which cross-girders extend across the dock to the corre-

sponding column on the opposite side, which girders form a large wrought-iron gridiron or platform, which is raised or lowered at pleasure with the vessel upon it. When a vessel is to be repaired, an open pontoon is selected to suit its dimensions, which is sunk in position to the bottom of the dock, and resting on the iron gridiron. After the vessel is floated over the pontoon, the whole is raised by the hydraulic presses, and the pontoon being emptied of water, sustains the weight of the vessel to be repaired, and is then floated away into some convenient part of the dockyard.

In the U. S. dockyards, dry docks, lift docks and marine railways are found on the Atlantic coast from Maine to Florida; on the Pacific from California to Washington; along the shores of the Great Lakes, and in the Philippines. On the Atlantic seaboard the most easterly harbor is Bath, Me., which has no dry docks, but a ship railway with a cradle 200 feet long. Extensive shipbuilding, however, is carried on in this city. At Charlestown, a suburb of Boston, is located the Navy Yard, well equipped for making extensive repairs and for building large engines and ships. Besides the old granite dry dock, built in 1827, the government has now under construction a concrete dock about 750 feet in length over all, with 30 feet of water on the sills. At East Boston is located the plant of the Atlantic Works, covering about 12 acres of land. The largest ship that can be built and launched from the ways of this company is one of 3,500 gross tonnage; to build such ships and overhaul and make extensive repairs, the yard is fitted with a modern plant. This company operates three marine railways, the largest having a capacity of 2,000 tons. The Simpson Patent Dry Dock Company own three dry docks, one of which is 465 feet over all, with 19 feet of water on sills. New York is well supplied with shipbuilding plants and shipyards in addition to the Navy Yard plant. The largest private docks are owned by J. N. Robins Company, one being 510 feet over all, with 22 feet of water on the sill, and one 600 feet over all, with 25 feet of water on the sill. There are also floating docks with a capacity sufficient to enable them to lift almost any of the vessels docking at New York, except the largest Trans-Atlantic liners. The principal ones being the Morse Shipbuilding Company in South Brooklyn, with a lift dock capable of handling vessels of not over 15,000 tons, and the Tietjen & Lang docks at Hoboken, with four lift docks for small repair work.

DOCKET, or DOQUET, n. *dŏk′ĕt* [diminutive from *dock*, to curtail: comp. W. *tocyn*, a slip, a ticket]: ticket or label, with written direction thereon, tied to goods; piece of paper or parchment containing the heads, or a summary, of any large writing; register of cases in a court; schedule of matters to be brought before a deliberative body: V. to mark their contents on the back of papers; to indorse; to form an abstract; to mark with a ticket. DOCK′ETING, imp. DOCK′ETED, pp.—All attestations or declarations annexed

to written instruments are called dockets, particularly those done by a notary. The notarial docket, formerly common to all solemn instruments, is said to be the most ancient example of fixed style in Europe. The attestation was in Latin.

DOCK WAR'RANTS, in England: orders or authorities for the removal of goods and merchandise warehoused in docks. The orders are granted by the proper officer at the docks, on application of the importer, in favor of any one whom the latter shall name.

DOCK-YARDS, ROYAL: spaces and warehouses inclosed in a dock for naval stores, with all appliances for ship-building, for the British navy. (See the titles of the several towns where they are situated.)

Most of the royal ships are built by the government, at one or other of the dock-yards at Portsmouth, Plymouth, Sheerness, Chatham, or Pembroke. Each of these establishments comprises covered slips on which the ships are built, docks in which they are kept, and all the appliances for rigging them out for sea. Boat-building and mast-making are also carried on; and in some, though not all of the yards, rope-making, sail-making, anchor-forging, block-making, and other manufacturing operations connected with the finishing and furnishing of ships. There are also arrangements connected with the storing of guns and other munitions of war. For naval repairs and refitting abroad, Britain maintains royal dock-yards at Gibraltar, Malta, Halifax, Bermuda, the Cape of Good Hope, Jamaica, Ascension, Trincomalee, and Hong-kong. Since the creation of a steam-navy, and the large substitution of iron for wood in shipbuilding, an increasing proportion of the royal ships are built in private yards. All the dock-yards are under the admiralty, and each is governed by a distinct set of officers responsible only to that department. The chief officer, called the superintendent, is generally an admiral, but sometimes only a captain; and the office is deemed an honorable recognition of past services. The dock-yards of France are at Cherbourg, Brest, L'Orient, Rochefort, and Toulon; of Germany, at Kiel, Danzig, and Wilhelmshafen; and of Russia, at Cronstadt, Sebastopol, and Vladivostok. See UNITED STATES NAVY YARDS.

DOCTOR, n. *dŏk'tẽr* [F. *docteur*—from L. *doctor*, a teacher, a doctor—from L. *docĕō*, I teach: Sp. *doctor*]: contracted into Dr.; the highest degree conferred by a university in divinity, law, medicine, music, or science; one who practices medicine; a physician; a learned man: V. *colloquially*, to apply medicines for the cure of diseases; to adulterate. DOC'TORAL, a. *-tŏr-ăl*, pertaining to a doctor. DOC'TORALLY, ad. *-lĭ*. DOC'TORATE, n. *-āt*, or DOC'TORSHIP, n. degree or rank of a doctor. DOC'TORING, n. in *familiar language*, the adulteration of liquors and articles of domestic consumption; the giving medicines to. DOC'TORLY, ad. *-lĭ*, like a learned man. DOC'TRESS, or DOC'TORESS, n. a woman who acts as a physician. TO DOCTOR

ACCOUNTS, to falsify them. DOCTORS, in *slang*, false dice made to turn up certain winning numbers. DOCTORS' COMMONS, *Brit.*, the place where the doctors of the civil law formerly lived and ate *in common*—and, the official residences and offices of the judges of various courts, as the court of arches, or the admiralty.

DOC'TOR: teacher. Originally, the word doctor was used, in accordance with its etymological derivation, to signify a teacher in general, and it was not till the 12th c. that it became a title of honor for the learned, irrespective of the function of communicating knowledge. It had frequently appended to it, in those early days, some additional expression intended to characterize the peculiar gift of its possessor. Thus Thomas Aquinas was called the Doctor Angelicus; Bonaventura, the Doctor Seraphicus; Alexander de Hales, the Doctor Irrefragabilis; Duns Scotus, the Doctor Subtilis; Roger Bacon, the Doctor Mirabilis; William Occam, the Doctor Singularis; Gregory of Rimini, the Doctor Authenticus; Joseph Gerson, the Doctor Christianissimus; Thomas Bradwardine, the Doctor Profundus; and the like. The word had long been used, even in the universities, as a general expression for a teacher before it came to designate a degree or rank in the learned hierarchy to which only the united body of the teachers could advance or promote the candidate. These formal promotions commenced at Bologna in the 12th c., and the learned Irnerius, regenerator of the Roman law at that period, is said to have introduced the ceremonial afterward universally adopted. Irnerius, however, is a sort of mythical hero in university history, and such statements with regard to him must be received with caution. See PROMOTION. The Univ. of Paris almost immediately followed in the footsteps of Bologna, the first reception of doctors having taken place in 1145, in favor of Peter Lombard and Gilbert de la Porrée, the greatest theologians of the day. Subsequently to this period, the emperors were accustomed expressly to confer upon the universities the right of appointing doctors of laws by their authority and in their name. The example of the emperors was speedily followed by the popes, who conferred corresponding rights with reference to the canon law. From the 11th to the 13th c., there seems reason to believe that, both in Italy and in France, the terms master and doctor were nearly synonymous. In the German universities, the professors of theology were more commonly known as masters; and in the beginning of the 15th c., in accordance with the practice of the Univ. of Prague, the distinction was consistently made between doctors of law and medicine, and masters of theology and philosophy. In modern times, the title of Doctors has been applied almost everywhere to the three faculties of Theology, Law, and Medicine. In Germany, as also to some extent in the United States, it extends to that of philosophy, in which, in Great Britain, the older title of master is still retained. The doctor's degree is, in general, conferred at the instance of the dean of

the faculty to which it appertains. It is granted either on examination, and after the ancient form, at least, of publicly defending a learned thesis in Latin has been observed, or else it is an honorary degree, conferred in consideration of the general reputation of the recipient for eminence in some particular branch of learning, philosophy, or science. See DEGREE. In Germany the doctor ranks before the untitled nobility and next to the knight; and among themselves, doctors take the rank of the faculties to which they respectively belong, the first being theology, the second law, and the third medicine. In Oxford and Cambridge, and recently also in the German universities, and in some American colleges, doctors of music have been created. In Germany, learned ladies have occasionally shared the honors of the doctorate. Dorothea Schlözer received the degree of doctor of philosophy from the Univ. of Göttingen, 1787; Mariane Charlotte von Siebold, that of medicine from Giessen, 1817; and Johanna Wittenbach, in philosophy, from Marburg, 1827. Of the four ancient degrees of Bachelor (q.v.), Master of Arts (q.v.), Licentiate (q.v.), and Doctor, the modern Univ. of France has retained only those of bachelor, licentiate and doctor. Until the revolution the highest consideration attached to the title of Doctor of the Sorbonne (q.v.)—that famous theological faculty, which was called 'the perpetual council of the Gallican church,' and of which the present faculty of theology of the Acad. of Paris is but a lifeless reproduction. But though the degrees of Sorbonne continued to receive, and apparently to merit, some degree of respect, not so was it with those of the other schools of learning in France. Furrettière, in his Dictionary, defines a bachelor as a man who learns, and a doctor as a man who forgets. The ridicule of Voltaire, La Fontaine, Le Sage with his Doctor Sangrado, and Molière in the *Malade Imaginaire*, will readily occur to our readers as illustrating the position which was then held very generally by French doctors.

In England, the doctor's degree was not introduced into the universities till the reign of John or of Henry III. At first it was a very rare and highly prized honor, and the ceremony of conferring it was attended by scenes of feasting and revelry, of which curious accounts will be found in Antony à Wood's *History and Antiquities of the University of Oxford*. Colored engravings of the dresses worn by doctors of the several faculties at Oxford and Cambridge are given in Ackermann's Histories of these Universities. As to professional uses of the degree of Doctor of Civil Law, see DOCTORS COMMONS.

DOC'TORS COMMONS: formerly the college of the doctors of civil law in London, wherein the court of admiralty and the principal ecclesiastical courts were held. It was founded by Dr. Henry Harvey, Dean of the Arches, previous to which time the doctors had lived in Paternoster Row. The original building was burned in the great fire in 1666, when the doctors removed for a time to Exeter

House. After some time the Commons was rebuilt, and the doctors returned to their former quarters. The courts which had been wont to hold their sittings at Doctors Commons are—the court of arches, the archdeacon's court, the prerogative court, the faculty court, the court of delegates, and the court of admiralty. The prerogative court, the court of delegates, the court of arches, the archdeacon's court, the faculty court, and the court of admiralty, have been changed, and no longer continue to exercise their functions in this once famous spot. The court of arches (so called from having sat in *Arcubus*, or under the arches or bows of Bow Church, Cheapside) is the court of appeal belonging to the abp. of Canterbury. The judge in this court is styled dean of the arches, and he has jurisdiction, as the abp.'s principal official, in all ecclesiastical causes within the province of Canterbury. The archdeacon's court is an inferior court for the consideration of ecclesiastical questions occurring within the archdeaconry, For an account of other courts mentioned in this article, see their titles. The practitioners in the several courts to which we have alluded were the doctors of civil law, called in the ecclesiastical courts advocates and proctors, who performed similar duties to those of attorneys or solicitors in the courts of law and equity. Both classes of practitioners required, in order to their admission to practice, to obtain the fiat of the archbishop; and afterward to be duly admitted by the dean of the arches. The form of admission was in both cases attended with much ceremony. The doctor elect was introduced to the presiding judge by two doctors habited in their scarlet robes. The candidate then made a short Latin speech, and was admitted to practice in the courts. The habit of the doctors is a scarlet robe with a hood, trimmed with taffeta or white minever. The proctors were, in like manner, introduced by two senior proctors. In 1857 power was given by an act to dissolve the College of Doctors Commons and sell the property. The proctors received compensation, and all solicitors were allowed to act as proctors, and all proctors were turned into solicitors, all being alike solicitors of the supreme court. Nevertheless the old names continue, and will no doubt only by degrees cease to be used in reference to ecclesiastical court and proceedings. For a full account of Doctors Commons, see Stowe's *London*.

DOCTRINAIRE, n. *dŏk'trĭ-nār'* [F. a theorist—from L. *doctrīna*, instruction (see DOCTRINE)]: a propounder of a set of opinions; a dogmatic or political theorist: ADJ. of or pertaining to dogmatic theories. Doctrinaire signifies, properly, the scientific taking up and exposition of a subject, as opposed to a treatment superficial and resting on accidental characteristics. In general, however, it is used as a term of reproach, to characterize views which are deemed pedantic, unbalanced, theoretic, and unpractical. In this sense it was applied in France, during the Restoration, by the reactionary court party to the fraction of the parliamentary opposition, who supported scientific doc-

trines of constitutional liberty against the arbitrary will of the monarch. The party thus termed Doctrinaires, had its rallying-point in the salons of the Duc de Broglie, was led in the chamber by Royer Collard, and supported in the press and before the public by Guizot, and the younger members of what afterward became the Orleans party. The development of the constitution on the basis of the *charte* of Louis XVIII., was the watchword of those men; but their real inspiration was derived from England. When the revolution of 1830 occurred, they became the advisers and ministers of the king of the French, and were more deeply imbued with the principles of constitutional monarchy than any other political party that have ever existed in France. The true leaders of the *doctrinaires* were Mounier, Lally Tollendal, Clermont Tonnerre, Talleyrand, and the Abbé Montesquieu; and the cradle of the party was the original *comité* of the constitution, which, about 25 years before, elaborated the *charte* of 1814. Its later representatives found a centre in the court of the exiled Queen Marie Amalie at Claremont, and a vigorous supporter in her gifted son, the Duc d'Aumale.

DOCTRINE, n. *dŏk'trĭn* [F. *doctrine*—from L. *doctrīna*, instruction, learning—from *docĕō*, I teach: It. *dottrina*]: whatever is taught; a principle or position laid down by a teacher; any tenet or dogma; one of the truths of the Gospel: see DOGMA. DOCTRINAL, a. *dŏk'trĭ-năl* [F.—L.]: pertaining to or containing doctrine. DOC'TRINALLY, ad. *-lĭ.*—SYN. of 'doctrine': dogma; tenet; principle; precept; maxim; instruction; erudition.

DOCUMENT, n. *dŏk'ū-mĕnt* [F. *document*—from L. *docŭmen'tum*, an example, a lesson—from *docĕō*, I teach: It. *documento*]: any paper containing written instructions or proofs for information, etc.; written evidence; record. DOC'UMEN'TARY, a. *-mĕn'tĕr-ĭ*, of or relating to written instructions or evidence also DOC'UMEN'TAL, a.

DOD, DANIEL, American mechanic: b. Virginia 1788, Sep. 28; d. New York 1823, May 9. He was educated at Rutgers College. He devoted himself to the study of steam machinery and the construction of steam-engines; the Savannah, the first steamship to cross the Atlantic, had an engine of his construction. He was killed by the explosion of a boiler on a steam-boat, the machinery of which he had altered.

DODD, ANNA BOWMAN BLAKE, American author: b. Brooklyn, N. Y. She was married to Edward Williams Dodd in 1883. She has been a voluminous writer for the magazines from her youth. Her published books are: *Cathedral Days; The Republic of the Future; In and Out of Normandy Inns; Glorinda; Falaise; On the Norfolk Broads; The Struthers;* and *An American Husband in Paris.*

DODD, FRANK HOWARD, American publisher: b. Bloomfield, N. J., 1844, Apr. 12. He prepared at Bloomfield Academy to enter Yale, but instead went into business in the employ of his father, M. W. Dodd, succeeding to the

business with Edward S. Dodd, as the firm of Dodd & Mead, in 1870. He is now the head of the firm of Dodd, Mead & Co.

DODD, Moses Woodruff, American publisher: b. Bloomfield, N. J., 1813, Nov. 11; d. New York 1899, April 8. He graduated from Princeton in 1837 and entered the theological seminary, but abandoned his theological course on account of failing health. In 1839 he became a partner with John S. Taylor in the publishing business; Taylor retired the next year, and the surviving partner carried on the business for 30 years, under the firm name of M. W. Dodd.

DODD, *dŏd*, William, ll.d.: 1729–1777, July 27; b. Bourne, in Lincolnshire, England. He educated first at a private school; and was admitted, 1745, as a sizar to Clare College, Cambridge, where, after five years of study, he took his degree b.a. He went to London, received orders from the bishop of that city, and soon gained reputation as a popular preacher and successful littérateur. Through his celebrity as a divine and man of letters, and by flattering persons in high position, he prospered in London, and in 1763, was appointed tutor to Philip Stanhope, fifth Earl of Chesterfield. Dodd's habits, however, were very expensive, and an income of £800 per annum, augmented by the produce of his literary labors, was inadequate. His extravagance brought his ruin. He forged the signature of his former pupil, the Earl of Chesterfield, to a bond for £4,200. For this crime he was arrested, 1777, Feb., and though he refunded the money, he was sentenced to death, which sentence was executed. His writings are numerous and varied. His *Beauties of Shakespeare* (2 vols. Lond. 1753) is well known, as are also his *Reflections on Death* (1763), and *Thoughts on Death*, a poem composed during his imprisonment before the execution.

DODDART, n. *dŏd'ërt:* a game played by two sides with bent sticks and a ball, similar to hockey (q.v.); the bent stick or club used in the game.

DODDER, n. *dŏd'-dẽr* [Ger. *dotter*], (*Cuscuta*): a family of plants, probably degenerate *Convolvulaceæ*, and known as *Cuscutaceæ*. They differ from *Convolvulaceæ* in the habit of the plants which are leafless climbing parasites with flowers in dense clusters; in having scales on the tube of the corolla alternate with its segments; and in having a spiral thread-like embryo, lying in a mass of fleshy albumen, while the cotyledons are so small that the embryo has been described as destitute of them. There are about 50 known species of *Cuscutaceæ*, found chiefly in the warmer temperate parts of the globe. The name dodder is often extended to all of them. One or two species of *Cuscuta* are natives of Britain, parasitic on leguminous plants, heath, thyme, hops, nettles, etc. A species of dodder is very injurious to crops of flax in Germany, and leguminous crops often suffer from this cause in the south of Europe. The seed of dodder germinates in the ground, but the stem soon seeks to attach itself to plants by little rootlets which

it sends out, and the original root dies. The appearance of dodder has been described as resembling 'fine, closely tangled, wet catgut.' DOD'DERED, a. *-derd*, overgrown with dodder.

DODDRIDGE, *dŏd'rĭj*, PHILIP, D.D.: 1702–1751, Oct. 26; b. London: eminent English Independent minister and author. He was educated for the ministry at a theological acad. at Kibworth, Leicestershire, presided over by John Jennings. In 1722, he became pastor of the Independent congregation at Kibworth, and in 1729 received a call to Northampton, where he also became president of the theological acad. removed from Kibworth. Here he continued to preach and train young students for the ministry till near the time of his death at Lisbon, whither he had gone for the benefit of his health. Doddridge was a man of the most amiable character, deep piety, and extensive accomplishments. His principal work is *The Rise and Progress of Religion in the Soul* (1750).

DODDS, ALFRED AMEDEE: a French military officer; b. 1842, Feb. 6; in St. Louis, Senegal; entered the French army in 1864; commanded the expedition which resulted in the conquest of Dahomey and the dethronement of Behanzen, 1894; and was appointed commander-in-chief of the French forces in Indo-China. He became an officer of the Legion of Honor, 1883, commander, 1891, and grand officer, 1892.

DODECADACTYLON, n. *dō-dĕk-a-dăk'tĭl-ŏn* [Gr. *dō-deka*, twelve; *daktulos*, a finger]: the upper extremity of the small intestines; the duodenum, so called because it is 12 finger-breadths long.

DODECAGON, n. *dō-dĕk'ă-gŏn* [Gr. *dōdĕkă*, twelve; *gōnĭă*, a corner or angle]: a figure having twelve equal sides and angles: see REGULAR PLANE FIGURES.

DODECAGYNIAN, a. *dō'dĕk-ă-jĭn'ĭ-ăn* [Gr. *dōdĕkă*, twelve; *gŭnē*, a female]: pertaining to an order of plants. the DO'DECAGYN'IA, n. *-ĭ-ă*, having twelve pistils or styles,

DODECAHEDRON, n. *dō'dĕk-ă-hē'drŏn* [Gr. *dōdĕkă*, twelve; *hĕdra*, a base]: one of the five regular solids; it is bounded by 12 equal and regular pentagons: see REGULAR PLANE FIGURES. DO'DECAHE'DRAL, a. *-hē'drăl*, consisting of 12 equal sides or bases.

DODECANDRIAN, a. *dō'dĕk-ăn'drĭ-ăn*, or DO'DECAN'DROUS, a. *-drŭs* [Gr. *dōdĕkă*, twelve; *anēr* or *andra*, a male]: pertaining to a class of plants, the DO'DECAN'DRIA, n. *-drĭ-ă*, having 12 stamens.

DODECANE, n. *dō'dĕ-kān* [Gr. *dōdĕkă*, twelve]: in *chem.*, a hydrocarbon of the paraffine group, containing 12 atoms of carbon.

DODECARCHY, n. *dō'dĕk-ār'kĭ* [Gr. *dōdĕkă*, twelve; *archē*, rule, government]: a government by 12.

DODECASTYLE, n. *dō-dĕk'ă-stīl* [Gr. *dōdĕkă*, twelve; *stulos*, a column]: in *arch.*, a portico having 12 columns in front.

DODECASYLLABLE, n. [Gr. *dōdeka*, twelve; Eng. *syllable*]: a word of 12 syllables.

DODECATEMORY, n. *dō′dĕk-ă-tĕm′ẽr-ĭ* [Gr. *dōdĕkătos*, twelfth; *morĭŏn*, a part]: in *astrol.*, a term applied to the twelve houses or parts of the zodiac of the primum mobile, *prī′mŭm mō′bĭ-lē*, to distinguish them from the 12 signs.

DÖDERLEIN, *dö′dẽr-līn*, Ludwig: 1791, Dec. 19–1863; b. Jena: German philologist. He studied at Munich, Heidelberg, Erlangen, and Berlin; and in 1815 was appointed prof. of philology at the acad. of Berne. About 1820, he went to Erlangen as second prof. of philology, and in 1827 became first prof., also director of the philological seminary. His principal works are *Lateinische Synonymen und Etymologien* (6 vols. Leip. 1826–38); *Lateinische Wortbildung* (Leip. 1838); *Handbuch der Lat. Etymologie* (Leip. 1841); *Homerisches Glossarium* (3 vols. 1850–58). Döderlein also edited several classical works, such as the *Œdipus Coloneus* of Sophocles, and the *Opera* of Tacitus.

DODGE, n. *dŏj* [imitative of the sound of a lump of a moist soft substance thrown on the ground, then the jerk with which it is thrown: Bav. *dotsch*, a mass of something soft: Scot. *dod*, to jog: comp. Gael. *doigh*, method, manner —from *doid*, the hand]: a low trick; a shifty contrivance; a quibble; a ruse; an evasion: V. to shift place by a sudden start; to deceive one by change of motion; to be evasive; to quibble. Dodg′ing, imp. Dodged, pp. *dŏjd*. Dodg′er, n. one who dodges or evades; a young thief.

DODGE, Charles Richards, American textile fibre expert: b. Covington co., Miss., 1847, July 17. He was educated at the Sheffield Scientific School of Yale and was assistant entomologist in the United States Department of Agriculture 1867–77, editing *Field and Forest* 1874–7. Since 1890 he has been in charge of the fibre investigations of that department. He has published 20 special reports on fibres and fibre industries, including a *Dictionary of the Fibre Plants of the World*.

DODGE, *dŏj*, Greenville Mellen: b. Danvers, Mass., 1831, Apr. 12: soldier and engineer. He graduated at the Norwich (Vt.) Milit. Acad. 1850; removed to Ill. 1851, and followed railroad surveying there till 1854; and was similarly engaged in the far west till the beginning of the civil war. He declined a commission of capt. in the regular army, raised the 4th Io. regt. and took the field as its col. 1861, June. He served with Fremont in Mo.; commanded a brigade in the army of the south-west and one on the extreme right at the battle of Pea Ridge, where three horses were killed under him, and he received several wounds; was promoted brig.gen. 1862, Mar., and assigned to command the dist. of the Mississippi; distinguished himself at Corinth during the Vicksburg campaign, at Sugar Valley and Resaca; was promoted maj.gen. of vols. 1864, June; commanded the 16th army corps in the Ga. campaign; repulsed a whole Confederate army corps with 11 regts. at

Atlanta 1864, July 22; was wounded in the siege of the city; and succeeded Gen. William S. Rosecrans in the command of the dept. of the Mo. In 1865 he was engaged in campaigns against hostile Indians, 1866, resigned from the army and became chief engineer of the Union Pacific railroad, and on the completion of that road, 1869, resigned to accept similar service on the Tex. Pacific road. He has since been engaged in railroad construction in the United States and Mexico. He served as a member of congress from Io. as a republican 1867–69, and as a delegate to the republican convention at Chicago 1868, and Cincinnati 1876.

DODGE, Mary Abigail (Gail Hamilton): b. Hamilton, Mass., 1830, died 1896, Aug. 17: taught school at an early age, became instructor in physical science in the Hartford High School, and while a member of the family of Dr. Gamaliel Bailey, of Washington, owner of the *National Era*, began her newspaper career with contributions to that publication, subsequently adding to her list the *Congregationalist*, *Independent*, New York *Tribune*, and *Atlantic Monthly*. Writing under a pseudonym composed of an abbreviation of her second name and the place of her birth, the freshness, crispness, and force of her varied contributions attracted early and wide attention. She was one of the editors of the Boston juvenile, *Our Young Folks*, 1865–1867, and wrote a series of notable letters on civil service reform for the *Tribune* 1877. Her published works are numerous and include *Country Living and Country Thinking* (1862), *Gala Days* (1863), *Stumbling Blocks* (1864), *Wool Gathering* (1867), *Woman's Wrongs: a Counter-Irritant* (1868), *Battle of the Books* (1870), *Woman's Worth and Worthlessness* (1871), *Sermons to the Clergy* (1875), *What Think Ye of Christ?* (1876), *Our Common School System* (1880), *Divine Guidance: Memorial of Allen W. Dodge* (1881), *The Insuppressible Book* (1885).

DODGE, Mary (Mapes): author: 1838; d. 1905, Aug. 21; b. New York, daughter of Prof. James J. Mapes. She was married to William Dodge, lawyer of New York, and was left a widow with two children. Turning her attention to literature she wrote a number of short tales and published them under the title of *The Irvington Stories* 1864. This work met such success that she was urged to prepare another immediately; and, 1876, brought out *Hans Brinker, or the Silver Skates*, reprinted London 1867. Then followed *A Few Friends* (1870), *Rhymes and Jingles for Young Folks* (1874), *Theophilus and Others*, essays (1876), *Along the Way*, poems (1879), *Donald and Dorothy, a Story of American Life* (London 1883; New York 1884): all of which excepting *The Irvington Stories* and *A Few Friends*, out of print, are still published and have large sales. She was one of the first editors of *Hearth and Home*, and conducted the children's dept. several years, and after 1873 was editor of *St. Nicholas*, the illustrated magazine for children.

DODGE, Richard Irving, American military officer and writer: b. Huntsville, N. C., 1827, May 19; d. Sackett's Harbor, N. Y., 1895, June 16. He was graduated at the United States Military Academy in 1848. He was the author of *The Black Hills* (1876); *The Plains of the Great West* (1877), republished in London as *Hunting Grounds of the Great West;* and *Our Wild Indians* (1881).

DODGE, Theodore Ayrault, American military officer and writer: b. Pittsfield, Mass., 1842, May 28. He received his military education abroad. Returning to the United States, he enlisted (1861) in the Union service as a private, attaining the rank of colonel, 1865, Dec. 2. He has published: *The Campaign of Chancellorsville* (1881); a *Bird's-Eye View of the Civil War* (1883); *Patroclus and Penelope: a Chat in the Saddle* (1885); and a series of studies called *Great Captains*, comprising volumes on *Alexander the Great* (1890), *Hannibal* (1891), *Cæsar* (1892),*Gustavus Adolphus* (1895).

DODGE, Walter Phelps, American author and lawyer: b. of American parents in Syria 1869. He is a nephew of William Walter Phelps (q.v.). Among his works are: *Three Great Tales; As the Crow Flies;* and *A Strong Man Armed.*

DODGE, William Earl: 1805, Sep. 4—1883, Feb. 9; b. Hartford; merchant. He received a common-school education, entered a wholesale dry-goods store in New York when 13 years old, conducted the same business on his own account 1826–1833, married a daughter of Anson G. Phelps, became a member of the firm of Phelps, Dodge & Co., and remained at the head of the firm till 1879. He was delegate to the peace convention 1861, member of congress as a republican and served on the committee on foreign affairs 1866–7, member of the Indian commission, three times pres. of the New York Chamber of Commerce, a founder of the Union League Club of New York, vice-pres. of the American Bible Soc., trustee of Union Theol. Sem. and connected with many charitable institutions.

DODGE, William Earl: American merchant, son of the preceding: b. New York 1832, Feb. 15; d. Bar Harbor, Me., 1903, Aug. 9. He succeeded his father in the metal firm of Phelps, Dodge & Company, New York, and was long prominent in his native city as a man of business, philanthropist, and art patron. He was the first vice-president of the American Museum of Natural History and chairman of the Executive Committee of the Metropolitan Museum of Art, in which latter position he had been very active. He gave Earl Hall to Columbia University.

DODGSON, *dŏj'sŏn*, Charles Lutwidge ('Lewis Carroll'): English mathematician and author: b. 1833; d. Guilford 1898, Jan. 14. He took orders in 1861, and till 1881 was a mathematical lecturer. His first publication was *A Syllabus of Plane Algebraical Geometry* (1860); in the following year he issued the *Formula of Plane Trigonometry,* and in 1864 appeared his *Guide to the Mathemati-*

cal Student. He still remained quite unknown to the public at large, but in the next year became famous as the author of *Alice's Adventures in Wonderland*, which, though written for the young, has found not less appreciation among those of riper years, and has been translated into many languages. Equally delightful is the continuation of Alice's adventures narrated in *Through the Looking-glass and what Alice Found There* (1871), an exception to the common rule as to the inferiority of continuations. Both books were admirably illustrated by Tenniel. *The Hunting of the Snark: an Agony in Eight Fits* (1876), a fantastic narrative in verse, had by no means an equal popularity, however. Among his other works are: *Elementary Treatise on Determinants;* (1867); *Phantasmagoria and other Poems* (1869); *Euclid and His Modern Rivals* (1879); *Rhyme? and Reason?* (1883); *A Tangled Tale* (1885); *The Game of Logic* (1887); *Curiosa Mathematical* (1888 and 1893); *Sylvie and Bruno* (1889–93); and *Symbolic Logic* (1896).

DODKIN, n. *dŏd'kĭn* [Dut. *duitkin,* dim. of *duit,* a doit]: a little doit; a small coin.

DODO, n. *dō'dō* [Port. *doudo*, silly, foolish: Dut. *dodaers* —from *dodoor*, a sluggard], (*Didus*): large bird, formerly ranked among the *Brevipennes* (with the Ostrich, etc.), now commonly placed in a sub-family of the *Columbidæ* (Pigeons), though exhibiting very anomalous peculiarities but still more interesting because, while it appears to be now completely extinct, its extinction was very recent, and through the agency of man. The dodo (*D. ineptus*) was the only species of its genus, and is known to have existed within 200 years. It is described by several voyagers of the 16th and 17th c., and seems even to have been brought alive to Europe. It was entirely confined to the island of Mauritius; the Solitaire (*Pezophaps solitaria*) of Rodriguez, also extinct, being a very different bird. The dodo, according to the descriptions given of it by those who saw it, and which are confirmed by pictorial representations, apparently worthy of confidence, was a bird larger than a swan; of a very heavy, clumsy form and corresponding gait, with short thick scale-covered legs; three rather short toes before and one behind; large head; very large bill, the upper mandible longer than the under, and much hooked at the point; the wings so short as to be of no use for flight, and furnished only with a few black feathers; the general plumage a kind of grayish-down; the tail merely a tuft or bunch of curiously curled feathers. The dodo was so abundant in Mauritius, that the discoverers of that island, 1598, became satiated with its flesh, though they describe it, particularly the breast, as good for food. The birds were easily killed, being wholly unable to fly, and running slowly. Their speedy extinction after the island began to be visited and settled, is thus accounted for. The dodo seems to have been adapted for living in tropical woods, where the luxuriant vegetation afforded it a ready supply of food, and its powerful hooked

bill, which has led some naturalists to assign it a place among birds of prey, was probably intended for tearing vegetable and not animal substances. However singular this bill is in a struthious bird, it has been well remarked that it is not more so than the very different bill of the *apteryx*.

There are rude figures of the dodo in several works of the 17th c., and in particular one, evidently superior to the rest, in Bontius (edited by Piso, 1658)—who calls the bird *Dronte* or *Dodaers*—which perfectly corresponds with the descriptions given of it, with a painting preserved in the British Museum, said to have been drawn in Holland from the living bird, and with a representation of it discovered by Prof. Owen 1838, in Savery's picture of *Orpheus and the Beasts at the Hague*, which he thinks 'must have been copied from a study of the living bird.' The skeleton has been partially reconstructed, and described by Prof. Owen. Many bones of this extinct bird were discovered 1865, when extensive marshes in the island were partially drained. There are bones at Paris, Copenhagen, and Haarlem. A foot of the dodo is among the valued treasures of the British Museum. In the Ashmolean at Oxford are a head and foot; but the stuffed specimen formerly there was allowed to decay, and finally destroyed 1755 by order of the curators.

DODONA, *dō-dō′nâ:* city of Epirus, seat of the oldest Grecian oracle there; in one of the wildest districts s.w. of the Lake of Janina. The Greek and Egyptian accounts of its origin differ. The priests of Jupiter in Egyptian Thebes related that two holy women were carried off from that city by a party of Phœnicians, one of whom was sold in Libya, the other to the Greeks, and that these women founded the oracles at Dodona and Ammon. The inhabitants of Donona related that two black doves took their flight from the city of Thebes, in Egypt, one of which flew to Libya, the other to Dodona; that the latter perched upon an oak, and with a human voice commanded that an oracle should be founded on the spot. Herodotus is of the opinion, that if the Phœnicians did actually carry off the two women already alluded to, one of them was probably sold into Greece; that the strange language and dark complexion had caused them to be likened to birds; and that when they became acquainted with the Greek tongue, they were said to have spoken with a human voice. Later authors ascribe the founding of the city to Deucalion. The sanctuary itself was dedicated to Jupiter, who manifested himself from the boughs of an oak, probably by the noise of the wind through the tree. This was explained by the priests, who were termed Selloi or Helloi. The goddess Dione, by some said to be Aphrodite, by others Hera, afterward appeared by the side of Jupiter, and the place of the priests was occupied by priestesses, who announced the will of the deity. Dodona, though not equal in renown to Delphi, was yet frequently consulted on occasions of importance by the Spartans and Athenians. Though

the city of Dodona was destroyed B.C. 219, by the Ætolians, it recovered at a later period, and was in existence in the 6th c. See *Dodone et ses Ruines*, by Carapanos (1878).

DODONÆA, *dŏd-o-nē′a* [named after *Dodonœus*, i.e., after Rembert Dodoens, a Belgian botanist and physician, who died A.D. 1585]: genus of *Sapindaceæ*, type of the tribe *Dodoneæ*. The whole plant is viscous and aromatic; locality: Australia without the tropics, and more rarely other hot countries. The leaves of *Dodonea viscosa* are used in baths and fomentations. DODONE′Æ, *-ē*, tribe of *Sapindaceæ*.

DODRANS, n. *dō′drănz* [L. *dequadrans* (*lit.*, less by one-fourth), three-fourths—from *de*, away, and *quadrans*, a fourth part]: nine-twelfths or three-quarters of a Roman *as;* three-quarters of a foot; nine inches, or about a span.

DODS, MARCUS, Scottish theologian: b. Belford, Northumberland, 1834. He was educated in Edinburgh, and in 1858 was licensed as a minister of the Free Church of Scotland. In 1866 he was ordained to Renfield Free Church, Glasgow, where he remained till appointed in 1889 to the chair of New Testament exegesis in New College, Edinburgh. Among his published works some of the most important are: *The Prayer that Teaches to Pray* (1863, 6th edition 1889); *Epistles to the Seven Churches* (1865); *Israel's Iron Age* (1874); *Mohammed, Buddha, and Christ* (1877); *Handbook on Genesis* (1882); *Parables of Our Lord* (1883 and 1885); *How to Become Like Christ* (1897); *Genesis, John and First Corinthians in the Expositor's Bible.*

DODSLEY, *dōdz′lĭ*, ROBERT: 1703–64; b. near Mansfield, in Nottingham, England: author and publisher. His father, said to have been a schoolmaster, apprenticed him to a stocking-weaver; but Dodsley ran away, and was afterward engaged as footman. While thus employed, he devoted his leisure moments to reading and the cultivation of letters, and eventually published, 1732, a volume of poems, entitled *The Muse in Livery, or the Footman's Miscellany*. His next production, *The Toy Shop*, a dramatic piece, was submitted in manuscript to Pope, who undertook to recommend it to Rich, manager of Covent Garden Theatre. It was acted under Rich's management in 1735 with great success. The proceeds resulting from the publication of these his first two works enabled Dodsley to commence business as a bookseller, in which trade he was very successful. In 1737, his *King and the Miller of Mansfield* was brought out at Drury Lane, with an enthusiastic reception. This was followed by *Sir John Cockle at Court, The Blind Beggar of Bethnal Green*, and *Rex et Pontifex*, republished in a collected edition of his dramatic works with the title of *Trifles* (1748). Meantime, he was conducting his business with such ability and spirit, that in the course of three years after beginning he was in a position to buy copyrights. In 1738, he bought Johnson's *London*, giving for it no more than ten guineas. His most

successful work was a tragedy called *Cleone*, acted at Covent Garden with extraordinary success. On its publication, 2.000 copies were sold the first day, and within the year the work ran through four editions. With *Cleone* he ende his dramatic authorship. Dodsley was connected as either contributor or publisher, occasionally as both, with several magazines. He is now remembered chiefly for his *Select Collection of Old Plays* (12 vols. 8vo, 1780); and his *Collection of Poems by Several Hands* (4 vols. 12mo, 1748). Besides *Trifles*, another volume of his collected works was published 1772 under the title of *Miscellanies*. —See Knight's *Shadows of the Old Booksellers* (1865).

DOD'SON, John E., American actor: b. England, 1857. He studied law, but early in life went on the stage, appearing first in Manchester; he supported Charles Manchester and other star players in England; and in 1889 came to the United States with Mr. and Mrs. Kendal. His first appearance in New York was at the Fifth Avenue Theatre in *A Scrap of Paper;* later he joined the Empire Theatre Company as leading comedian. He originated the character of Richelieu in *Under the Red Robe*, and has taken the part of Richelieu in *Richelieu's Stratagem*, and the part of John Weatherby in *Because She Loved Him So*.

DOD'WELL, Edward: 1767–1832, May 14; b. England: artist. He received a collegiate education, and from 1800 till his death passed the most of his time traveling on the continent of Europe. His principal publications are *A Classical and Topographical Tour through Greece during the Years* 1801, 1805, *and* 1806, superbly illustrated, 2 vols. 4to (1818), and *Thirty Views in Greece* (1821). He also left drawings of a work on *Cyclopean or Pelasgic Remains in Greece and Italy*, published after his death.

DODWELL, Henry: 1641–1711, June 7; b. Dublin: chronologist. He graduated at Trinity College, Dublin, removed to London 1674, became an author and critic, and Camden prof. of history at Oxford 1688. He was a prolific writer, and published *Annals of Thucydides and Xenophon* (1696), *Annotations on the Greek Geographers, Dissertations on the Ancient Cycles of the Greeks and Romans* (1701),.

DOE, n. *dō* [L. *dama;* Ger. *dam;* AS. *da;* Dan. *daa*, fallow deer: It. *daino*, the female of the same kind]: a female of the fallow deer, also of the rabbit—the male is called a *buck*. Doe-skin, leather prepared from the skin of a doe; a stout tweeled woolen cloth.

DOE, *dō*, John: former fictitious plaintiff in ejectment whose services are dispensed with since the abolition of the fiction. See Ejectment.

DOER, n. *dō'ẽr:* one who performs, obeys, or practices. Does, v. *dŭz:* see under Do.

DOFF, v. *dŏf* [contraction of *do off*—opposite of Don, *dŏ on*]: to divest; to strip; to put off; to take off, as the hat. Dof'fing, imp. Doffed, pp. *dŏft*. Dof'fer, n. a revolving cylinder in a carding machine, which doffs, or strips off, the cotton from the cards: see Carding.

DOG, n. *dŏg* [Icel. *doggr;* Dut. *dogghe,* a large dog]: a well-known domestic animal; the male of certain animals, as the fox; applied to a man, in reproach; an iron bar with a sharp fang, used to fasten a log of timber; an andiron (q. v.); a name applied to various tools, pieces of machinery, etc., having a curve like the neck of a dog: V. to follow insidiously; to follow on the track vindictively; to hunt or follow closely for a particular purpose. DOG'GING, imp. DOGGED, pp. *dŏgd.* DOG'GISH, a. *-ĭsh,* churlish; like a dog; brutal. DOG'GISHNESS, n. DOGGED, a. *dŏg'gĕd,* sour; surly; sullen; sullenly obstinate. DOG-GEDLY, ad. *-lĭ.* DOG'GEDNESS, n. *-nĕs,* sullen determination. TO THROW TO THE DOGS, to throw away as useless. TO GO TO THE DOGS, to go to ruin. DOG-BEE, a fly troublesome to dogs; a male bee. DOG-BELT, in *coal-mining,* a term applied to a broad belt of strong leather, worn round the waist, to which a chain is attached for the purpose of drawing the dans or sledges in the lower workings. DOGBERRY, the berry of the dogwood; the cornel; *Cornus sanguĭnĕă,* etc., ord. *Cornācĕæ.* DOG-CART, a light open carriage having a box at the back for dogs, but extensively used for other purposes. DOG-BRIER, the dog-rose; the *Rōsă cănīnă,* ord. *Rosācĕæ.* DOG CHEAP [may be a corruption of OE. *god chepe,* good bargain: prov. Sw. *dog,* very: Low Ger. *döger,* very much]: very cheap; cheap as dog's meat. DOG-DAYS, the part of the summer from about the beginning of July to the middle of August—originally applied to the time during which Sirius or the Dog-star was above the horizon with the sun (see CANICULAR DAYS). DOG-FLY, a species of fly infesting woods and bushes. It is extremely voracious, and its bite is very sharp and especially annoying to dogs. DOG-GRASS, a wild plant, about two ft. high, with straight stem, creeping root, and leaves soft and green; also called couch-grass (q.v.), quitch-grass, knob-grass, or dog-wheat; *Trĭtĭcum rĕpĕns,* ord. *Gramĭnĕæ.* DOG-LOUSE, the *Hæmotopinus piliferus,* a parasitical insect that infests dogs. It is of an ashy-gray color. DOG-LATIN, a corrupt or barbarous Latin. DOG-ROSE, a species of wild rose, the fruit having the name of DOG-HIP; same as DOG-BRIER. DOG-SHORES, the short pieces of timber by which a ship on the building slip is supported; see SHORE 2. DOG'S-EAR, the corner of the leaf in a book turned down. DOG'S-EARED, folded down, as the corners of the leaves of a book. DOG-STAR, the bright star called *Sirius,* whose rising and setting at the same time as the sun gave name to the dog-days. DOG-WATCH, among sailors, a watch of two hours only, usually the two watches from 4–6 and 6–8, P.M. DOG-HOLE, a place fit only for dogs. DOG'S-MEAT, refuse food; offal. DOG-TEETH, the canines or sharp-pointed human teeth growing between the fore teeth or incisors and the grinders. DOG IN THE MANGER, an ill natured, churlish person, who will not allow to another the use of a thing that is useless to himself. *Note.*—DOG and DOGGED, 'to follow on the track vindictively,' is said to come from the root of the Gael. word *doganta,* 'fierce, mo-

rose, 'nick set,' and was bestowed originally on bull-dogs and others of the fiercest kinds: Gael. *dog*, 'coarse, thick.' —Dr. C. Mackay.

DOG, *dog* (*Canis*): genus of digitigrade (q.v.) carnivorous (q.v.) quadrupeds, which, as defined by Linnæus, included all that now form the family *Canidæ* (q.v.), also hyenas. In the genus as now restricted, wolves and jackals are generally included by naturalists, with those animals to which alone the name Dog is popularly applied; and a distinctive character of principal importance is found in the pupil of the eye, which is always round—contracting circularly, while in foxes it assumes the form of a section of a lens when contracted. For wolves and jackals, see those titles: see also titles of the more important particular kinds of dogs.

At the very outset we encounter one of the most perplexing and difficult questions in natural history, as to the number of *species* of dog, and the origin of the domestic dog; two questions in appearance but one in reality, and one on which the opinions of the most eminent naturalists are divided. According to some, all domestic dogs are to be regarded as of one species; and as in the case of some other valuable domestic animals, that species is not certainly known to exist in a truly wild state, all the wild dogs which must be admitted to belong to the same species being viewed as the offspring of domestic dogs which have returned to a wild state, and in which, however, it is supposed that the original type or characteristics of the species, modified by domestication, have in a great measure reappeared. According to others, there are numerous species of dog, originally distinct, which have been domesticated by the inhabitants of different countries, but which, however, are very nearly related not only in their physical characters but in their dispositions and in some of their principal instincts, and which were capable of intermixing, not perhaps indiscriminately, but within certain limits, and so as to produce new races. By some who hold the first of these opinions, it is maintained further that the wolf and the dog are one species, and that all domestic dogs are derived from the wolf; while others advocate the jackal as their original parent and type. By some of those who hold the species to be numerous, it is supposed not improbable that the blood of wolves and of jackals may be mixed in some of the domestic races with that of the original dogs.

It is admitted on all hands, that there is great diversity among the different kinds of domestic dogs, many distinct races having long existed, which differ not only in size and other physical characters, but to a notable extent also in dispositions and instincts; it is admitted further that there appear no definite limits to the possible intermixture of these races with each other. So great is the diversity of physical characters, that naturalists of the greatest eminence almost acknowledge themselves incapable of pointing out any that are common to all dogs, yet distinguish them

all from the different species of wolves and jackals; and in fact, *recurved tail*, not apparently a character of the first importance, is named by Cuvier himself as the most certain and unvarying specific distinction. The obliquity of the eyes of wolves is also contrasted with the more forward direction of those of dogs, which is accounted for—in favor of the theory of wolfish origin—by the supposition that it results from 'the constant habit, for many successive generations, of looking forward to their master, and obeying his voice.'—Bell's *British Quadrupeds*. This, on the other side, is treated with ridicule; it is certainly a transition from the region of observation and ascertained fact to that of mere theory and conjecture. In size, dogs differ so widely that one is not as large as the head of another; the difference in form of body, head, or limbs, is almost equally great between the Newfoundland dog or the mastiff and the greyhound. The gradations, however, from one form or character to another, render it impossible to draw a fixed limit. In some races of dog, the hind-feet as well as the fore-feet have five toes, instead of the more common four; but this has not been much insisted on as a ground of specific distinction. Greater value attaches perhaps to the lack in some, as the dholes (q. v.) of India, of the second tubercular tooth in the lower jaw; also the hairiness of the soles of the feet of some is perhaps important; and in favor of the opinion that domestic dogs have originated from an intermixture of several species, it has been urged that the number of teats in the female varies, and that there is sometimes even a difference between the number on one side and on the other, which has never been observed in wild dogs, and in them the number in the same kind is always uniform. Some of these points have not received the investigation necessary to determine their importance.

It seems to have been too hastily taken for granted, in favor of the opinion that there is only one species of dog, that all the wild races, even the dholes and the dingo, have sprung from domestic progenitors. There is certainly no evidence of this; and the fact that wild races exist, exhibiting marked diversities of character, in countries widely remote and of very different climates, is referred to with confidence on the other side, as affording at least a strong presumption in favor of the supposition that man has, in different countries, domesticated the species which he found there. We do not yet know enough of the amount and limits of the changes which circumstances and climate may produce, to warrant any confident conclusions on that ground. And if we were to adopt the views of those who ascribe least to such causes, we might yet demand of them to show why, although from certain original types no mixed race can originate, there may not yet be other original types capable of such combination, or why the limits must be held equally impassable between all that were framed by an original act of creation. That there was only one original pair of the human race, may be held, without of necessity holding that there was only one origi

nal pair of dogs. But to this consideration due place has, perhaps, scarcely been given.

That the common fox—or any species of fox—is a parent of any race of dogs, is not the opinion of any naturalist. Some dogs have a somewhat fox-like appearance, and indeed it is now generally admitted that the dog and fox will breed together, but as it has not been proved that the individuals of the cross will breed together, this fact does not warrant the assertion that the dog and fox belong to the same species. Instances of commixture between the dog and wolf have occurred in greater numbers, and without the compulsion of confinement, but in this case, too, the only recognized proof of identity of species—namely, the permanent fertility of the progeny—is wanting.

In favor of the specific identity of the dog and wolf, one of the strongest arguments is drawn from the equality of the period of gestation—63 days. But it may be remarked that an inequality of the period would have afforded a much stronger argument on the other side.

Against the identity of the dog and wolf, the difference of disposition has been strongly urged. In reply, it is shown by well-authenticated instances that the wolf is very capable of that attachment to man which so remarkably characterizes the dog. There is greater value, perhaps, in the argument of Col. Hamilton Smith, that 'if domestic dogs were merely wolves modified by the influence of man's wants, surely the curs of Mohammedan states, refused domestic care, and only tolerated in Asiatic cities in the capacity of scavengers, would long since have resumed some of the characters of the wolf.'

Buffon's notion, that the shepherd-dog is the original type of the whole species, from which all dogs are derived, is merely fanciful, and his endeavor to support it by a comparative view of the different kinds, is merely ingenious.

The shepherd's dog is one of the kinds of dog having greatest development of brain, but it is still greater in the spaniel. The skulls of dogs exhibit no very marked distinctions when compared with each other, nor when compared with those of wolves and jackals.

It is universally believed that the diversity of color exhibited by many dogs is a result of domestication, as it is found neither in those which may be supposed to exist in a state of original wildness, nor in those wild races certainly known to be the progeny of domestic dogs, a return to uniformity of coloring being apparently one of the most speedy consequences of a return to wildness. Black, reddish-brown, and white, the uniform colors observed in wild dogs, are, however, the colors which chiefly appear mixed in domestic races.

Pendulous ears are generally regarded as another result of domestication in dogs, as in rabbits; and it is certain that the wild races known have erect and pointed ears; but no wild race has been discovered at all corresponding to the mastiff in some of its other most notable characters, particularly the shortness of the muzzle, and depth of the chops, and it has therefore been conjectured that this and

kindred races may have derived their origin from some wild dog of the interior of Asia, which has not yet come under the notice of any scientific observer.

The dog has been a domestic animal from a very early period. The earliest allusions to it are in the books of Moses, but they correspond with the dislike and contempt still commonly entertained for it by many of the nations of s. Asia. By Homer, however, it is very differently mentioned; and 'there is not a modern story of the kind which can surpass the affecting simplicity with which the poor dog's dying recognition of his long-lost master is related by one who wrote, probably, not less than 2,700 years ago.' The sculptures of Nineveh, and the hieroglyphics of Egypt, attest the very early domestication of the dog, and the existence of races similar to some at the present day; and the high value attached to it by many nations is further attested by the place assigned to it, or its image, as emblematic of the attributes which they ascribed to their gods. We do not now set so high a value on the dog, in consideration of mere usefulness to man, as on some of the other domestic animals; yet to the savage it is perhaps the most important of all, and some have supposed that by its aid the subjugation of other animals may have been first accomplished. Cuvier makes the strong assertion, that the dog 'is the most complete, the most singular, and the most useful conquest ever made by man.' The dog, far more than any other animal, becomes a humble friend and companion of man, often seeming actually to know and sympathize with the joys and sorrows of his master; and on this account it is, that he is alike 'the pampered minion of royalty and the half-starved partaker of the beggar's crust'

The uses to which the dog is applied are numerous, and correspond, in some measure, not only with distinct physical characters, but with remarkably distinct instincts of different breeds. Thus, while in some countries dogs are employed chiefly as beasts of draught, particularly for drawing sledges in the frozen regions of the north; and in other countries chiefly for the chase, the exquisite scent of some kinds, and the remarkable fleetness of others, variously recommending them for this use; they also render important services in the care of sheep and other cattle, and are endowed with hereditary instincts wonderfully fitted for this purpose; and with like adaptation of instinct they are highly valuable in watching and protecting the abodes and properties of their masters. Not the least interesting of the employments to which the dog has been devoted by man, is that of leading about the blind, often with an intelligent and affectionate solicitude.

Anecdotes illustrating the instincts, and the intelligence and affection of dogs, are familiar; they are also worthy of philosophic consideration.

The dog produces usually from six to ten young ones at a birth. They are born blind, open their eyes about the tenth or twelfth day, attain their full growth in about two years, seldom live more than 12 or 15 years, and almost never more than 20.

No satisfactory classification of the different kinds of dog has ever been made. What some naturalists regard as types of species, others pronounce mere mongrel races. Nor can any principle of arrangement be found in form, roughness, or smoothness of fur, or other such character, which will not associate kinds that are in other respects widely dissimilar, and separate some nearly allied.

Col. Hamilton Smith arranges domestic dogs in six groups or sections: 1. 'The wolf dogs,' including the Siberian dog, Esquimaux dog, Iceland dog, Newfoundland dog, Nootka dog, sheep dog, great wolf dog, great St. Bernard dog, Pomeranian dog, etc. 2. 'The watch and cattle dogs,' including the German boar-hound, Danish dog, matin, dog of the N. American Indians, etc. 3. 'The greyhounds,' including the Brinjaree dog, different kinds of greyhound, Irish hound, lurcher, Egyptian street dog, etc. 4. 'The hounds,' including the bloodhound, old southern hound, staghound, foxhound, harrier, beagle, pointer, setter, spaniel, springer, cocker, Blenheim dog, water dog or poodle, etc. 5. 'The cur dogs,' including the terrier and its allies. 6. 'The mastiffs,' including different kinds of mastiff, the bulldog, pugdog, etc. Col. H. Smith does not include in any of these groups the dholes, dingo, etc., which he even separates from the genus *Canis*. —Mr. Richardson arranges dogs in three great groups, 'indicated by the least variable part of their osteological structure, cranial development.' 1. Including the Irish wolf dog, Highland deerhound, all kinds of greyhounds, and the tiger hound, characterized by *convergent* parietal bones, an elongated muzzle, and high and slender form. 2. Including the great Dane, the French matin, the pariah of India, the bloodhound, staghound, foxhound, harrier, beagle, pointers, terriers, turnspit, Newfoundland dog, Labrador dog, Pomeranian dog, Esquimaux dog, Siberian dog, Iceland dog, shepherd's dog, etc., characterized by *parallel* parietal bones, and generally by much acuteness of smell. 3. Including mastiffs, the great St. Bernard dog, bulldog, pugdog, etc., characterized by sensibly *divergent* parietal bones, bulk of body, robust structure, and combative propensities.

DOG'BANE (*Apocynum*): genus of plant of the nat. ord. *Apocynaceæ*, having bell-shaped flowers, no style, and the fruit a long linear follicle. Some of the species are shrubby, some herbaceous; some extend into colder climates than is usual for plants of this order. The Dogbane of N. America (*A. androsæmifolium*), a perennial herbaceous plant, about four ft. high, with smooth stem, much milky juice, smooth ovate leaves and whitish rose-colored flowers, growing in open barren places from Georgia to Canada, is valued for the medicinal properties of the bark of its root, which is emetic, diaphoretic, and in small doses tonic. The root of Canadian Hemp (*A. cannabinum*), a plant noticed on another account in the article *Apocynaceæ*, has similar properties, and is frequently used in the United States.

DOGE, n. *dōj* [It. *doge*, a doge, a certain general—from mid. L. *duca*—from L. *ducem*, a leader], (equivalent to *duke*): name of the chief magistrate, possessing princely rank, in the ancient republics of Venice and Genoa. Dogate or dogado, both from the Latin *ducatus*, duchy, is used to indicate the dignity of doge. We find doges of Venice elected by the people, but exercising almost the rights of absolute monarchs, as early as the beginning of the 8th c. Their power was considerably reduced toward the end of the 12th c., through the creation of a Great Council, of 470 members chosen from nobles as well as citizens, and invested with legislative power. These afterward appointed six of their own number to superintend the doge in the exercise of his executive power. Further, the *pregadi*, or nobles, who formerly were admitted by the doge to a share in the public affairs, were organized into a regular board of administration, numbering 60 members. By the new constitution, the people, too, lost the most essential of their rights—viz., the right of electing the doge. This right was now changed into a privilege belonging exclusively to the Great Council, whose members elected 24 from among themselves, and these latter again elected, by ballot, 12 of their own number, upon whom devolved the right of appointing a doge. Sebastiano Ziani was the first thus elected, 1177; and on the occasion of his elevation to office, he scattered money among the people, to console them for the loss of their rights—an act which was imitated by his successors, and soon became a recognized custom, as was also the manner in which he went through the ceremony of wedding the Adriatic Sea. The Pope Alexander III., whom, during his quarrels with the Emperor Frederic I., the doge had faithfully supported, sent him, with other privileges, a ring, as the symbol of the domination which the republic had acquired over the Adriatic. Accordingly, a marriage-ceremony took place on Ascension Day—a ring being thrown from the ship *Bucentaur* into the sea, to show that 'as the wife is subject to her husband, so is the Adriatic Sea to the republic of Venice.' The practical bearing of the ceremony soon appeared in the shape of stringent measures, regulating the navigation of the Adriatic, and imposing tribute on all foreign ships. The power of the doge underwent, 1179, a signal modification; the Treble Quarantia—a high court of justice, originally of 40 members—having been erected, as also the board of *Advogadori* for the settlement of fiscal questions instituted. During the reign of Jacopo Tiepolo (1229–49), a new restriction arose from the creation of an independent police, and a still greater one from the formation of a tribunal of three inquisitors and five correctors, who, on the demise of a doge had to examine his conduct, sifting the minutest particulars of his private life. All these changes were effected by the Great Council, to the thorough exclusion of the people. In 1268, the Great Council, in order to cut short all family influence upon the affairs of the state, devised a curious and extremely complicated mode of election; but notwithstanding the limitations new and old, the power of a doge

continued great, if he was only wise enough to profit by the contentions between nobles and citizens, the disputes of the different authorities, and especially by his own position as commander-in-chief of the forces and high-admiral of the navy. This last prerogative remained in vigor till 1628, when, by a formal enactment, the D. was prohibited the exercise of such command unless authorized by the Council of Forty. Other privileges, however, belonging originally to the dogate, were abrogated or circumscribed long before this, especially during the period 1289–1311. Thus, at the instigation of the D. Gradenigo, who was actuated by jealousy toward the mighty family Tiepolo, the famous law of 'closing the Great Council' was passed, and by it the whole legislative and judicial power made the heirloom of those families whose names were inscribed in the Golden Book, or *Libro d'Oro*. About that time (1309), ecclesiastics of any degree were declared unfit for political or judicial functions. To counterbalance the influence of discontented nobles, a yearly public feast was instituted—at which the D. gave a dinner to the fishermen, fraternizing with them in testimony of equality. Shortly before Gradenigo's death, that terrible tribunal, the Council of the Ten, was erected, which was to be the highest in the state, irresponsible, and entitled to pass judgment upon the D. himself. Meanwhile, the Great Council managed to circumscribe the functions of the D. public as well as private, in the minutest way. It was ordered that the D. should not announce his accession, except to the princes of Italy; neither was he permitted the opening of dispatches emanating from the popes or from princes; the kissing of his hands, or kneeling down in his presence, was strictly interdicted. He could not leave town, be possessed of real property abroad, or allow his children to contract matrimonial connections with foreign houses, accept donations, etc. He had to submit to the continued presence of two *advogadori*, to be fined for the least mistake, and bear the expenses of the ducal dignity from his own purse. To all these restrictions and burdens the D. declared himself liable on the occasion of his coronation, by signing a document headed 'Promissione.' The state costume and retinue of the D. were minutely defined, and a trifle fixed as his salary. As a symbol or princely dignity, the D. wore a horned cap, and had the title of Serenity. The credentials of ambassadors were written in his name, but signed by a secretary of state, and sealed with the arms of the republic. The money was struck in his name, but not with his stamp or arms. All the magistrates rose and saluted the D. when he came into council, and he rose to none but to foreign ambassadors. His family was exempt from the jurisdiction of the Master of the Ceremonies; and his children, though excluded from public offices, were allowed to have staff-officers, and gondoliers in livery. After the death of And. Dandolo, 1354, on a motion from the correctors, the three presidents of the quarantia, and later six ministers, were joined to the six privy-councillors of the D., who, together with the above-

named, has formed henceforward the so-called Signoria Serenissima. At that stage the rank of doge could no longer be an object of ambition, and as early as 1339 a law was necessary to prohibit one elected from resigning his place. And. Contarini, 1367, accepted the proffered dignity only upon the threat of being declared a traitor to the country. In 1413, by a law emanating from the Great Council, the doge was even denied the title of Signoria, that of Messere being substituted instead; at the same time he was deprived of the right of convening an *arengo* or meeting of the people. With the fall of the Venetian Republic, 1797, the dignity of doge also disappeared. There were in all 73 doges at Venice, the first of whom, Anafeste (Paoluccio), was elected 697; the last, Manin (Lodovico), 1788. In the Palazzo Ducale, the celebrated frieze of the doges is to be seen round the Sala del Maggior Consiglio, exhibiting 72 portraits, and one space covered with a black veil, with an inscription, indicating that Faliero (Marino) was beheaded for high treason.

The republic of Genoa elected, after a victory gained by the party of the people (1339), Simon Boccanera for its first doge. He was elected for life, and with absolute power, of which, however, he allowed a share to 12 aldermen (*anziani*), one half chosen from the *cittadini* citizens), the other among the *nobili* (nobles). In the long run of centuries, the power, duration, and splendor of the ducal seat underwent frequent changes, arising from the vicissitudes of the state and the hostilities between the popular and aristocratic parties. A constitution for defining the functions and prerogatives of the doge was framed 1528, after the great victory of And. Doria over the French. According to this constitution, which, with slight modifications, remained till the end of the republic, the dignity of doge was of two years' duration, under restrictions similar to those at Venice. The candidate was to be a noble, at least 50 years of age. The doge presided, with the right of veto, in the sittings of the Great Council of 300 members, as also in those of a smaller one of 100. These two councils exercised the legislative power, whereas the executive was vested in the doge, with 12 *governadori* and 8 *procuratori*, among these latter being always the doge retiring. During the time of his government, the doge resided in the state palace, where he was liable to the same restrictions and ceremonies in use at Venice. When, 1797, Genoa was occupied by the French, the dogate ceased to exist; in 1802, the Genoese Republic being, conjointly with the Ligurian, re-established, the ducal dignity was resuscitated; but in 1804, it disappeared for ever, the republic itself having been dissolved.

DOGE'S PALACE, THE (It. *Palazzo Ducale*), the official residence of the former rulers of Venice, begun in 1350 and finished in 1442. Its variegated walls of marble and its colonnades make it one of the most striking sights of the city. It is famous for its carvings and paintings. The halls of the interior are adorned with works by Titian, Tintoret, Veronese, and other Venetian masters.

DOGFISH.

DOG'FISH: popular name of some of the smaller species of shark; apparently owing its origin—like the names porbeagle, hound, etc., bestowed on others of the same family—to their habit of following their prey like dogs hunting in packs. They belong chiefly to *Mustelus* and *Squalus*, two quite unlike genera. In their general anatomy, they differ but little from the other sharks, so well known for their ferocious and savage habits. The dogfishes, though among the smallest of the tribe, manifest propensities equally cruel with those which have rendered the white shark and others so justly dreaded. Although seldom or never injurious to man, they commit great ravages in the fisheries, and where they abound constitute one of the greatest nuisances to the fishermen. Exceedingly voracious and devouring almost everything which they encounter, the mischief they occasion by taking the baits, and very often the hooks, of the deep-sea lines, is very considerable and not at all compensated for by the flesh of those which are captured.

The smooth dog-fish or dog-shark (*M. caninus*) is found on both sides of the North Atlantic, and on the American side is particularly abundant south of Cape Cod. It is about 2 to 3 feet long. No spines occur in the margins of the dorsal fins, and the smooth pavement-like teeth are especially adapted for crushing crabs, lobsters, and other testaceous invertebrates on which they chiefly feed. The young are hatched from the egg in the oviducts of the female (with which, however, they are not connected by a placenta, as in the related *Galeus mustelus* of Europe), and are born alive. The eggs are similar to others of the family, and covered by a tough membranaceous integument. The skin of these fish is beset with numerous small asperities, which render it, when dried, well adapted for polishing wood and for other mechanical purposes.

The spiny dog-fish (*Squalus acanthias*) is very abundant on the coasts of New England, and, although similar in size and general aspect, is readily distinguished from the smooth dog-fish by the presence of a strong spine before each of the two dorsal fins. The eggs are deposited before hatching. This species furnishes material for a valuable fishery and fish industry in Maine, where the oil is extracted from the livers, the flesh ground up for fertilizers or poultry food, and the skin utilized for polishing metal and wood. The dog-fish feeds chiefly on herring and mackerel, the schools of which it follows in immense numbers. Similar species occur in the Pacific Ocean and other seas.

The flesh of all the species is hard, dry, and unpalatable, requiring to be well soaked before it is eaten. In England the dried flesh goes under the name of Folkestone beef. Though almost never brought to market, is much used for food in the Orkney Islands. It has been suggested that fins of these and other sharks might be used for making gelatine soup, as in China. Poisonous effects are at certain times observed in consequence of eating the livers of dogfish, and some cases are recorded in which the most distressing illness has been occasioned by the practice. The

name dog-fish is also applied to several other quite distinct fishes, more particularly to the western mud-fish or bow-fin (*Amia calva*), and to the dog-salmon (*Oncorhynchus keta*).

DOG'-FOX: name sometimes given to certain small animals of the family *Canidæ* allied to the *Corsac* (q.v.), and, like it, referred to the genus *Cynalopex*. They have a sharp muzzle like that of a greyhound, rather large, erect, pointed ears, the pupil of the eye contracting circularly as in the dog, the tail bushy like that of a fox. They inhabit warm parts of Asia and Africa; and some, if not all of them, burrow.

DOGGED, DOGGEDNESS: see under Dog.

DOGGER, n. *dŏg'gĕr* [F. *dogre;* Dut. *dogger* a vessel—the Dut. *dogger* originally signifying a cod-fish; Icel. *dugga*]: vessel something like a galliot or a ketch, used by the Dutch as a fishing-boat, usually for herring, in the German Ocean. It is not certain whether it was named after the Doggerbank, or *vice versâ*.

DOGGERBANK, *dog'gĕr-bănk:* extensive flat sand-bank in the middle of the German Ocean, between England and Denmark; lat. 54° 10′—57° 24′ n., long. 1°—6° 7′ e. This shoal stretches 320 m. e.n.e. from 12 leagues east of Flamborough Head to within 20 leagues of Jutland. A prolongation runs e. toward Horn Point, Denmark. The bank is in some parts 60 m. broad, but the average breadth is 40. Toward the English coast, the water above it is only 9 fathoms deep, in some parts it is 30, but the average depth is 15 to 20. The surrounding sea is in many parts 24 to 60 fathoms deep. The surface of the bank consists chiefly of fine sand and ooze. It is the seat of important English and Dutch cod-fisheries. It supplies especially the English market. About 12,000 men are employed in the fishery; and each vessel stays on the bank eight weeks, then returns to port to refit. At the s. end of Doggerbank, 1781, occurred the indecisive naval fight between the Dutch and English fleets, under Admirals Zoutman and Parker, respectively.

DOGGEREL, n. *dŏg'gĕr-ĕl,* or Doggrel, n. *dŏg'rĕl* [comp. Gael. *do-ghradh,* disagreeable, unpleasant; *docair,* bad, painful: perhaps connected with Dog]: a sort of loose or irregular kind of poetry, unpleasant to the ear: Adj. a name applied to rude burlesque poetry, as *doggerel* verse or rhyme.

DOG'GET'S COAT AND BADGE: prize at a rowing-match on the Thames, from London Bridge to the Old Swan at Chelsea, yearly, Aug. 1. It was instituted by Thomas Doggett, a native of Dublin in 1715. The first prize is an orange-colored waterman's coat and a silver badge representing the white horse of Hanover, and to this have been added other prizes, the first prize being also augmented. The competition is by six young watermen whose apprenticeships have expired the previous year, each in a boat by himself, with short oars or sculls; and the race is at the hour when the current of the Thames, by recession of the tide, is strongest against the rowers.

DOGLIANI, *dōl-yâ'nē:* town of Piedmont, n. Italy, in a mountainous district on the left bank of the Rea, 12 m. n.e. of Mondovi. D. has the remains of an old castle, but no other buildings worthy of note. Here five annual fairs are held, at which cattle, hemp, and victuals are chiefly sold. Pop. 2,000.

DOGMA, n *dŏg'mă*, Dog'mas, n. plu. *-măz*, or Dog'mata, n. plu. *-mă-tă* [Gr. and L. *dogma*, a received opinion —from Gr. *dŏkĕō*, I judge, I think: comp. Gael *dogh*, an opinion]: a settled opinion; a doctrine; the ecclesiastical formula in which a truth or doctrine of revealed religion is expressed; a tenet or point of faith in religion or philosophy. Dogmat'ic, a. *-măt'ĭk*, or Dogmat'ical, a. *-ĭ-kăl*, positive; disposed to insist imperiously or with high authority; overbearing; arrogant. Dogmat'ically, ad. *-lĭ*. Dogmat'icalness, n. Dogmat'ic, n. one of an anc. sect of philosophers. Dogmat'ics, n. plu., or Dogmatic theology, doctrinal theology, or the systematic arrangement and treatment of the doctrines of the Christian religion. Dog'matize, v. *-mă-tīz* [F. *dogmatiser*]: to assert positively without proving; to teach with bold confidence; to advance opinions or teaching with arrogance. Dog'mati'zing, imp. Dog'matized, pp. *-tīzd*. Dog'mati'zer, n. *-tī'zĕr*, one who. Dog'matist, n. a positive or confident asserter; one who boldly and arrogantly advances statements and principles without proof. Dog'matism, n. *-tĭzm*, arrogance in stating opinions or principles; positive assertion.—Syn. of 'dogma': tenet; opinion; proposition; principle.

DOG'MA, in Theology: properly a doctrine founded on Scripture, and advanced not for discussion but for belief. But as this method of stating a proved truth easily degenerates into the assertion of opinions without ground, and without regard to the aspect that they may present to others, *dogma* and *dogmatism* have come in English to be almost synonymous with assertion without proof.

In European continental theology, however, the word is still used without implying any censure, Dogmas (Ger. *dogmen*) meaning simply doctrines; and this is the case in our own expression, Dogmatic Theology, or Dogmatic, which is that branch of theology that treats of the systematic arrangement of the doctrines of Christianity. Older names for the same thing were *Loci Theologici* and *Theologia Positiva*.—The first attempt to give a connected view of Christian doctrine was in the 3d. c. by Origen in *De Principiis*. He was followed in the 4th c. by Augustine, who in *De Doctrina Christiana*, and other books, treated of the whole body of doctrine held by the church, though without any very scientific arrangement. The contributions to Dogmatic, made in the 5th, 6th, and 7th c., were mere collections of 'sentences.' In the East, in the 8th c., the doctrines of the Greek Church were treated by John of Damascus in a form already Aristotelian, and his work may be considered the first systematically arranged treatise on Dogmatic. He makes no mention of purgatory. His book was as influential in the Greek Church as the writings of Augustine

in the Latin. The regular systematizing of doctrines began with the SCHOLASTICS in the 11th c., but degenerated often into hair-splitting. The first cultivators of Dogmatic theology among the Scholastics were Hildebert of Tours and Abelard, followed by Petrus Lombardus, Alexander de Hales, Thomas Aquinas, Duns Scotus, etc.

The era of the Reformation awoke Dogmatic to a new life, leading it back from Aristotle to biblical theology. But the controversies between the different churches in the 17th c., and the too great importance attached to Confessions of Faith, cramped anew its freedom, and gave it again a Scholastic turn. Many of our still standard treatises on systematic divinity wear remains of these fetters, and contrast strikingly with the independence and vigor of inquiry in the similar works of Melanchthon, Calvin, and other reformers. A fresh revival followed in Germany the spread of the critical philosophy of Kant, when biblical theology rose up in distinction from the theology of confessions, and the dogmatic was grounded on the critical interpretation of Scripture rather than on traditional formulas. Hence, however, have sprung widely diverging views. One party still held fast by the existing confessions; another looked chiefly to the contents of Scripture; while a third subjected confessions and Scripture alike to the test of reason. Besides these, there arose in more recent times, a school of dogmatic theologians, formed on the philosophical systems of Jacobi and Schelling, who looked for the essence of religion in the human soul itself, and considered Christianity as the historical revelation of it. Of this school, Schleiermacher, and in some respects Neander and Rothe also, may be considered the representatives; and of all the German schools, it is that which seems to be exercising the greatest influence on the speculative theology of Britain and America. An important contribution to this department of theology was Peter Lange's *Philosophische Dogmatik* (2 vols., Heidelb. 1849–51). The Dogmatic of D. F. Strauss is constructed from the Hegelian point of view, and in its leading results comes back to the system of Spinoza.

It deserves remark that Christian dogmatic and morality, which it had been the custom to discuss separately since the 17th c., have recently been treated in combination by Nitsch and Beck. The scientific investigation of Christian doctrine in Germany has not been confined to the Prot. churches. A number of Rom. Cath. theologians have occupied themselves with this branch of sacred science; some, as G. Hermes of Bonn, inclining to freedom of investigation, and others, as Liebermann, to the defense of the usual formulas.

The HISTORY OF DOGMAS OR DOCTRINES has been raised in Germany to the rank of a distinct branch of sacred science. In Britain and America, the facts with which it deals have received in treatises on systematic theology only passing notice, and in ecclesiastical history have been considered as the 'internal history of the church.' Some works have been devoted to a brief outline presenta-

tion of the subject. The pursuit of this branch of inquiry is characteristic of Protestantism; in the Rom. Cath. Church, it is considered as endangering the unity of the faith. Many Protestants even dislike the idea of a 'development' of Christian doctrine, which seems involved in its having a history. It is not necessary, however, to believe that doctrines hitherto absolutely unknown or denied, came from time to time to be embodied in the orthodox creed of Christendom: see DEVELOPMENT OF DOCTRINE. The fact is indisputable that the several doctrines came one after the other into prominence in the consciousness or the experience of the church; and that in each period of her history there is some one leading doctrine which rises to importance, as if it were the mainstay of Christianity. To depict this succession or evolution of views with their struggles and modifications, and trace the different ways in which the several doctrines were at different periods formulated and embodied in the creeds, is the object of a History of Doctrines (Ger. *Dogmengeschichte*). There is, of course, room for great variety in the method of treating such a subject. Among the most important works on this subject is Neander's, edited by J. L. Jacobi, 1856 (English transl. 1858), and that of F. C. Baur (1847), whose name marks an era in this branch of study.

DOGS, *dŏgs*, ISLE OF, or *Poplar Marshes:* small peninsula in the county of Middlesex, England, formed by a circuitous winding of the Thames; in the vicinity of London, three and a half m. e.s.e. from St. Paul's Cathedral. It is about a mile long, and three-quarters of a mile broad. In what may be called the isthmus of the peninsula are the West India docks. It is said that the Isle of Dogs derives its name from the circumstance that the king's hounds were formerly kept here.

DOGS: see ANDIRON.

DOG'SHORE: see LAUNCHING.

DOG'S'-TAIL GRASS (*Cynosurus*): genus of grasses having a somewhat close spike or ear, each spikelet with two equal glumes and 3–5 florets, and beneath each spikelet a comb-like bract or involucre. The popular name is from a fancied resemblance. The species, not very numerous, are natives chiefly of Europe and Asia. Two are found in Britain, but one only is common and valuable, the CRESTED D. G. (*C. cristatus*), which forms an important part of almost all good pastures, and is esteemed particularly for sheep-pastures and lawns, for the improvement of which it is often sown. Its herbage is fine and close, and its deep roots secure it against droughts, which cause many other grasses to wither; but the herbage is not sufficient in quantity to make it desirable for hay.—The comb-shaped bract connected with each spikelet of this common grass is a very interesting and beautiful object. The seeds are small, shining, and yellow, whence the name *Gold-seed* sometimes given to this grass by farmers.

DOG'WOOD, or DOG'BERRY: name usually given to some of the arboreous and shrubby species of the genus

Cornus: see CORNEL. The United States species are many, including the Dwarf Cornel or Bunch-berry (*C. canadensis*), 5–7 in. high, and with showy flowers and bright red fruit like the Flowering D. (*C. florida*), but common only n.; and the following species with small-flowered cymes (like the European D., *C. sanguinea*), and with scientific names translated thus: the Round-leaved D., branches greenish; the Silky D., branches purplish; the Stolon-bearing, or Red Osier D., the new branches bright red; the Rough-leaved; the Stiff; the Panicled, branches gray; and the Alternate-leaved, branches white-streaked. The European D., has fruit which is small, purple, and very

Common Dogwood:
a, branchlet, with leaves and flowers; *b*, fruit

bitter, yields an oil said to be equal to that of the olive, and to the amount of 34 per cent. of its weight. This oil is used in France for lamps, and for the manufacture of soap. —The fine Flowering D. (*C. florida*) is a small tree, found in the United States, from lat. 43° to Florida, with oval leaves, and small yellowish flowers, which are surrounded by large white roundish bracts. The berries are red, and remain on the tree most of the winter. The flowers appear before the leaves, and their large white bracts are among the ornaments of the American woods in spring The tree attains a height of 20–30 ft., with a trunk 8 or 10 inches in diameter. The wood is white, hard, fine-grained, much esteemed and used for inlaying and ornamental work. The bark is very successfully employed in the cure of intermittent fevers. It is also a valuable tonic. It is one of the most valuable medicinal products of N. American. The barks of several other N. American species of *Cornus* possess similar properties.—JAMAICA D. is *Piscidia erythrina*,

of the nat. ord. *Leguminosæ*, sub-order *Papilionaceæ*, a good timber tree, with hard and resinous wood, which lasts well either in or out of water; the bark of the root powerfully narcotic, used for stupefying fish, and also for relieving toothache, being applied to the tooth in the form of a saturated tincture, or taken into the stomach as a powerful sudorific.

DOILY, n. *doy'lĭ* [probably a modification of Dut. *dwæle* and *dwaal*, a towel: Swiss *dwaheli*, a napkin: prov. Eng. *dwile*, a mop, a coarse rul bing-cloth]: a small napkin, plain or colored, used for various purposes, frequently at table for putting glasses upon during dessert. Some are highly ornamented. The name is said to be derived from the original maker; but probably it is a modification of the Dutch *dwaal*, the same word as the English *towel*, and was introduced with the article from Holland.

DOINGS, n. plu. *dô'ĭngz* [see Do]: actions good or bad, behavior; conduct; feats.

DOIT, n. *doyt* [Dut. *duit;* F. *d'huit*]: small copper coin current in Scotland during the reigns of the Stuarts. It was a Dutch coin (*duit*), in value the 160th part of a guilder, which, estimated at 20*d*. sterling, would make the doit equal to the eighth of an English penny, or half a farthing. By some authorities it is said to have been worth only the twelfth of a penny; in reality, it is difficult to say what was its worth, for being imported, like many other coins of the period, from Holland, it would rise and fall in value according to the scarcity of money. The doit must have been common in the early part of the reign of James VI. The kirk-session of Perth (1582, Apr. 16), 'ordains James Sym to give the witch in the tolbooth 8 doits in the day' for subsistence:

DOITED, a. *doyt'ĕd*, or DOITIT, a. *doyt'ĭt* [Scot.: see DOTED under DOTE]: in *Scot.*, stupid; confused; in *OE.*, superannuated.

DOKAMOK, *dŏk'ă-mŏk:* see BOCARDO.

DOKKUM, *dŏk'kŭm:* town in the Netherlands, province of Friesland, 12 m. n.e. from Leeuwarden, on the Ee (pronounced *ā*), which cuts it into two irregular parts. Within the town is a broad haven, both for sea-going and for inland ships. There are several regularly built streets and many neat houses. The trade in flax, cattle, wool, and chickory is extensive. Ship-building, gin-distilling, beer-brewing, carding wool, etc., are principal industries. There are a grammar and other good schools. Pop. 5,000.

DOKOS, *dŏk'ōs:* dwarfish African race of blacks, s. of Abyssinia.

DOLABRA, *do-lāb'ra:* rude ancient hatchet. It is represented on the columns of Trajan and Antoninus, and specimens abound in all museums. When made of flint, in their earliest and rudest form, they are usually called *celts;* see CELT.

DOLABRIFORM, a. *dō-lăb'rĭ-fawrm* [L. *dolābrā*, an ax; *forma*, shape]: in *bot.*, shaped like an ax.

MADONNA DELLE STOFFE, BY CARLO DOLCI.

DOLBEAR, Amos Emerson: an American educator and inventor; b. 1837; was graduated at Ohio Wesleyan University in 1866, and since then has been a college professor. He invented the writing telegraph, the magneto telephone, static telephone, spring balance ammeter; etc., and published *Chemical Tables; Art of Projecting; The Speaking Telephone; Matter, Ether, and Motion;* etc.

DOLCE, ad. *dŏl'chē* [It.]: in *music*, softly and with tenderness. Dolcissimo, ad. *dŏl-chĭs'sĭm-ō*, with the utmost degree of sweetness.

DOLCI, *dol'chē*, Carlo, or Carlino: 1616–1686, Jan. 17; b. Florence: celebrated painter of the Florentine school. He received his first instructions in art from Jacopo Vignali, a pupil of Roselli and a remarkably skilful teacher. His uneventful life was spent entirely in his native city. His works, chiefly madonnas and saints, exhibit the character attributed to him. The faces are full of a pleasing and tender softness. Dolci's drawing is generally correct, his coloring exquisitely delicate and transparent.

DOLDRUMS, n. plu. *dōl'drŭms* [AS. *dol-drunc*, foolish —from *dol*, erring; *druncnian*, to have the mind submerged by drinking: Gael. *dòl-dream*, a state of sulking; *doltrum*, grief, vexation]: a sailor's term for the tropical zones of calms and variable winds. To be in the doldrums, to be in low spirits, dejected, or melancholy.

DOLE, n. *dōl* [*dolor*, grief; *dolĕō*, I grieve (see Doleful)]: in *OE.*, grief; lamentation. Dolent, a. *dōl'ĕnt*, grieving; lamenting; sorrowing; sad. Doles, n. plu. *dōlz*, in *OE.*, fatal blows.

DOLE, n. *dōl* [Low Ger. *dole*, a dole: W. *twll*, a pit: Bohem. *dul*, a ditch, a mound]: a slip of pasture left between plowed lands; a boundary mark.

DOLE, n. *dōl* [from Deal, which see]: that which is dealt or distributed; a part, share, or portion of anything; money or provisions given in charity: V. to distribute grudgingly and in small portions. Do'ling, imp. Doled, pp. *-dōld*. Doles at funerals are of great antiquity. St. Chrysostom speaks of them as given to procure rest to the soul of the deceased. On this ground, as well as on the score of general benevolence, the practice of making gifts to the poor at funerals was common in Britain until comparatively recent times; for it was continued, sometimes on a munificent scale, long after the custom of praying for the dead had been abandoned on the introduction of reformed doctrines. Nichols, in his *History of Leicestershire*, speaking of Strathern in Framland Hundred, observes of this usage: 'In 1790, there were 432 inhabitants, the number taken by the last person who carried about bread, which was given for *dole* at a funeral; a custom formerly common throughout this part of England, though now fallen much into disuse. The practice was sometimes to bequeath it by will; but, whether so specified or not, the ceremony was seldom omitted. On such occasions, a small loaf was sent to every person, without any distinction of age or circum-

stances, and not to receive it was a mark of particular disrespect.' These doles, whether in money or in articles of food and ale, were at one time common in England, Wales, Ireland, and Scotland; and the custom may be said to have represented, in a simple state of society, that form of benevolence which, in the present day, consists of bequests to hospitals and other public charities.

DÔLE, *dōl:* well built town of France, dept. of Jura, 28 m. s.e. of Dijon. It is delightfully situated on a vineyard slope rising from the right bank of the river Doubs, and the environs are tastefully laid out in gardens and promenades. Dole is the *Dola Sequanorum* of the Romans, of whose presence the ruins of two aqueducts, an amphitheatre, several temples, and the 'street' or road which passed from Lyon through Dole to the Rhine, still give indications. There are also the remains of a castle built by Frederick Barbarossa in 12th c. Pop. 14,253.

DOLE, *dōl* (Lat. *dolus*, guile): in *Scotch law*, the amount of conscious guilt or evil intention necessary to make a legal crime. A person incapable of consent is incapable also of dole—*doli incapax*, as it is technically called. The corresponding English phrase is *felonious intent*.

DOLE, Charles Fletcher, American Unitarian clergyman: b. Brewer, Me., 1845, May 17. He is a brother of N. H. Dole (q.v.). He has been pastor of the Unitarian Church, Jamaica Plains, Boston, from 1876. He is the author of *The Citizen and the Neighbor; Jesus and the Men About Him* (1888); *A Catechism of Liberal Faith* (1895); *The American Citizen* (1891); *The Coming People* (1897); *Noble Womanhood* (1900), etc.

DOLE, Nathan Haskell, American writer: b. Chelsea, Mass., 1852, Aug. 31. He was graduated from Harvard 1874, and was literary and musical editor of the Philadelphia *Press* until 1887, when he became literary adviser to the publishing firm of T. Y. Crowell & Company. His principal original works are: *Young Folks' History of Russia* (1881); *A Score of Famous Composers; Not Angels Quite; On the Point* (1894); *The Hawthorn Tree* (1895); *The Mistakes We Make* (1898); and *Omar, the Tent-Maker* (1898). In 1899 he edited the complete works of Count Tolstoi. He has also translated *Maria y Maria*, *Maximina*, and *Sister St. Sulpice*, from the Spanish of Valdes, as well as various works from the French and German. In 1896 he edited a multivariorum edition of the *Rubaiyat of Omar Khayyam*, containing many translations in English, French, German, Italian, Hungarian, and Danish carefully collated.

DOLE, Sanford Ballard: an American statesman; b. 1844, in Honolulu, Hawaii; admitted to the Boston bar in 1873; returned to Honolulu in the same year; leader in a reform movement in 1887; a judge of the supreme court of Hawaii in 1887–93; placed at head of provisional gov. 1893; pres. till 1898; provis. gov. till 1900; afterward gov. till 1903 of U. S. Territory of Hawaii.

DOLE′-FISH; probably that fish which British fishermen employed in the north seas do of custom receive for their allowance, 35 Hen. VIII. c. 7.

DOLEFUL, a. *dōl′fûl* [Scot. *dule*, grief: L. *dolēre*, to grieve: It. *duolo*, pain: F. *deuil*, mourning]: sorrowful; expressing grief; sad; dismal; melancholy; querulous. Dole′fully, ad. *-lĭ*. Dole′fulness, n. the state or condition of being doleful. Dole′some, a. *-sŭm*, melancholy; gloomy; dismal. Dole′someness, n. condition of being dolesome; gloom.—Syn. of 'doleful': rueful; piteous; woeful; gloomy.

DOLERITE, n. *dŏl′ĕr-īt* [Gr. *dolĕrŏs*, deceptive]: a variety of greenstone, composed of felspar and augite, so called from the difficulty of distinguishing it from certain other trap rocks.

DOLGELLEY, *dŏl-gĕth′lē* or *dŏl-gĕl′lē:* ('dale of hazels') capital of Merioneth, N. Wales, near the centre of the county, and the largest town in it. It is on the banks of the Wnion, 208 m. n.w. by w. of London. It lies in a rich and picturesque valley, at the foot of Cader Idris, and during summer is frequented by English and foreign tourists. It has manufactures of coarse woolens and flannels; its Welsh Tweed is in great repute and demand throughout the kingdom; lamb and kid skins are tanned and dressed; and in the vicinity are fulling-mills and bleach-greens. Here, in 1404, Owen Glendwr held a parliament, and signed a treaty of alliance with Charles, King of France. Pop. 2,500.

DOLICHOCEPHALIC, a. *dŏl′ĭ-kō-sĕ-făl′ĭk*, or Dol′ichoceph′alous, a. *-sĕf′ă-lŭs* [Gr. *dolĭchos*, long; *kĕphălē*, the head]: long-headed; applied to the long skulled tribes of the human family, having the diameter of the head from front to back much greater than the transverse diameter. Dol′ichoceph′alism, n. *-sĕf′ă-lĭzm*, the state or condition of. Dolichocephali, n. plu. *dŏl′ĭ-kō-sĕf′ă-lī*, long-headed or long-skulled tribes of the human race; such are certain Australian and w. African races, and such was a long-headed race of cave-occupiers who inhabited Britain in prehistoric times. Dol′ichosau′rus, n. *-saw′rŭs* [Gr. *sauros*, a lizard]: in *geol.*, a snake-like fossil lizard, of about three feet in length, found in the chalk formation.

DOLICHOPODIDÆ, n. plu. *dŏl-ĭ-kŏ-pŏd′ĭ-dē* [Gr. *dolĭchos*, long; *pous*, a foot]: numerous family of small dipterous flies, belonging to the tribe *Tanystoma*. Dolich′opus, *-ĭk′o-pŭs*, genus of dipterous insects, typical of the family *Dolichopodidæ*.

DOLICHOS, *dŏl′ĭ-kŏs:* genus of plants of the nat. ord. *Leguminosæ*, sub-order *Papilionaceæ*, closely allied to *Phaseolus* (see Kidney Bean), and distinguished chiefly by the extension of the base of the standard to embrace the wings of the corolla at their base. The genus includes a considerable number of species, some shrubby, some annual, and some perennial herbaceous plants. Some have beautiful flowers, and some of the herbaceous species

are cultivated for their seeds, which afford a kind of pulse; or for their young pods, which, like those of the kidney bean, are boiled for the table. Among these are *D. Lablab*, native of India and Egypt (which has been made the type of a separate genus, *Lablab*); *D. Nankinicus* (or *Lablab Nankinicus*), a Chinese species; *D. Lubia*, native of Egypt; *D. sesquipedalis*, native of America; *D. Soya*, or *Soja hispida* (the soy bean), *D. Catiang*, and *D. uniflorus* (Horse Gram), natives of India; *D. sphærospermus* (Calavana or black-eyed pea), native of the W. Indies. In the climate of Britain, even the most hardy kinds require the aid of a little artificial heat, and they are reckoned inferior to other kinds of pulse or garden vegetables of easier cultivation. The well-known Chinese sauce or ketchup called Soy (q.v.) is made from soy bean. Allied to dolichos is the genus *Canavalia*, to which belong the Sword Beans of India. *C. gladiata*, the commonly cultivated species, has pods two ft. long. An allied genus is *Psophacarpus*. The seeds of *P. tetragonolobus*, formerly *D. tetragonolobus*, are used in the Mauritius as peas are in Britain; and its pods and tuberous roots are common Indian esculents. Some species of *Pachyrhizus*, also an allied genus, are remarkable for their tuberous roots, as *P. angulates* (formerly *D. bulbosus*), native of India, now cultivated in S. America and other warm countries, which produces pleasant turnip-like tubers; and *P. trilobus*, which has tubers two ft. long and nearly cylindrical, much used as a boiled vegetable in China and Cochin-China.

DOLICHURUS, n. *dŏl-ĭ-kūr′ŭs* [Gr. *dolichos*, long; *oura*, a tail]: in *pros.*, a verse having a redundant foot or syllable; in *entom.*, genus of hymenopterous insects, belonging to the family *Fossores*.

DOLINA, *dō-lē′nâ:* town of Austrian Galicia, in the circle of Stryi, 60 m. s. from Stryi, on an affluent of the Swica. It has extensive salt-mines. Pop. of town and commune about 8,000.

DOLIUM, n. *dō′lĭ-ŭm* [L., a cask, or tun]: the tun, genus of gastèropodous mollusks, family *Buccinidæ:* see Whelk.

DOLL, n. *dŏl* [properly a bunch of rags: Fris. *dok*, a little bundle: Ger. *docke*, a doll: comp Gael. *dealbh*, an image, a shape]: imitated baby or puppet; a small figure in the human form for the amusement of children. The word doll is of doubtful derivation; possibly from *idol;* in French, the name is *poupée;* in German, *puppe*, from Lat. *pupa*, a girl, a doll. The use of dolls dates from the most remote times, and is common in all countries, barbarous as well as civilized, springing from that love of nursing and fondling infants which is implanted by nature in the female character. Precisely as a child in a princely mansion fondles a costly and finely dressed doll, so does the child of an African or Esquimaux take delight in a piece of wood or bone carved rudely in the form of a baby—in fact, girls in the humbler ranks may sometimes be seen hugging and talking to a bit of stick decorated with a few rags, as if it were a live child.

As in the case of most other toys (q.v.), dolls were formerly imported into Great Britain chiefly from the Netherlands; hence a usual name for a doll was a Flanders baby. These old Flemish or Dutch dolls were of wood, with neatly formed faces and flashy dresses, the cheaper kinds having slender wooden legs. Latterly, there have been great improvements in the making of dolls, and in England and the United States it has become a manufacture; but there are still large importations from the countries on the Rhine, France, and Switzerland. In these continental countries, women and children mostly are engaged in the manufacture. Some carve the heads and bodies, others paint the faces and necks, others prepare legs and arms, and a different class cut out, sew, and put on the dresses. These operations are seldom executed in one manufactory. Usually, dealers buy the fragments so far prepared by villagers, and these are put together in a wholesale way. As the time employed in the preparatory processes is scarcely of any marketable value, the prices of fragments are most insignificant. Hence, as regards all the cheap kinds, with painted faces and ringlets, dolls can be imported at a cost below that at which they could be executed by hand labor. In dolls of a superior kind, with molded wax or composition faces, arms, and feet, glass-eyes, stuffed bodies, flaxen ringlets, and gauze dresses, the English, by their machinery and capital lead the trade. In this as in other trades, there is an economic division of labor; there are dolls' head-makers, dolls' leg and arm makers, doll sewers, doll stuffers, dolls' wig-makers, dolls' eye-makers, and doll dressers. For some dresses, remnants of calico, gauze, silk, and other materials, are procured from shops; but for fashionably dressed dolls, much in demand, it is necessary to buy goods on a large scale. The extent to which dolls' glass-eyes are manufactured is surprising. Some years ago, in evidence before a committee of the British house of commons, a glass-manufacturer at Birmingham stated that he had received, at one time, an order for £500 worth of dolls' eyes. The cheaper dolls' eyes are simply small hollow glass-beads, made of white enamel, and colored with black or blue, but without any attempt at variety or effect; while those eyes of a higher quality have a ring of color to represent the iris. It is stated in the experience of the trade, that since Victoria came to the throne, blue eyes for dolls have been in the ascendant in England; but that black eyes find the best market on the continent, especially for Spanish dolls. Black dolls are made for export to America, where they are in request by girls of negro parentage, and the introduction of gutta-percha is favorable for this branch of the trade. Composition-heads are usually of *papier-mâché*, cast in a mould, and waxed and painted to represent the features.

DOLLAR, n. *dŏl-lĕr* [Ger. *thaler:* Dut. *daler:* Ger. *zahlen*, to pay: comp. Gael. *dail*, to deliver, to deal: W. *talu*, to pay—*lit.*, the money in which payments were made]: a silver coin, the unit in the monetary system, of the United

States; in use also in Canada. *Dollar* is a variety of the Ger. *thaler*, Low. Ger. *dahler*, Dan. *daler;* and the word came to signify a coin thus: about the end of the 15th c., the Counts of Schlick coined the silver extracted from their mines at Joachims-thal (Joachim's Valley or *Dale*) into ounce-pieces, which received the name of Joachim's-thaler —the Ger. adjective from the name of the place ('Joachims-dalers'). These coins gained such reputation, that they became a kind of pattern; and others of the same kind, though made in other places, took the name, only dropping the first part of the word for shortness. The American dollar is taken from the old Spanish dollar or piastre, and is only slightly less. It was formerly only of silver; but in 1900 the gold dollar became the unit of value in the United States. In 1878, however, silver was 'remonetized,' and so now shares with gold the rank of standard money. Since 1837 the silver dollar proper is required by law to weigh 412½ Troy grains, and since 1873 the silver half-dollar 12½ metric grammes; the smaller coins, quarter-dollar and dimes, proportionately less. The standard fineness of both silver and gold for coinage is $\frac{9}{10}$, that is, 9 parts metal and 1 part alloy. The gold weighs 25.8 Troy grains. The British standard of fineness is $\frac{11}{12}$ for gold and $\frac{37}{40}$ for silver, and the actual value of the U. S. gold dollar in British currency, is 4s. 1½d. The U. S. gold coinage includes double-eagles (20 dollars), eagles (10 dollars), half-eagles (5 dollars), quarter-eagles (2½ dollars), with some 3 dollar and 1 dollar pieces. The U. S. silver 'trade' dollar authorized by act of congress 1873, Feb. 12, was designed for commercial use in eastern countries, and weighs 420 grains; none were coined after 1883, and it has since been withdrawn from circulation. Though the silver dollar is equally with gold a legal tender for all debts, its coinage was again discontinued by the repeal of the Sherman Law 1893. See MONEY: GOLD: SILVER: CURRENCY: BIMETALLISM: ETC.

DOL'LAR: village in Clackmannanshire, Scotland, on the right bank of the Devon, 10 m. e.n.e. of Stirling; in a plain under the Ochills (q.v.). Coal and iron occur in the vicinity. Dollar is noted for its academy, founded 1818 under the will of Captain M'Nab, a native of the parish, who bequeathed £80,000 for the purpose. It was incorporated by act of parliament 1847, and has a principal and 19 teachers in the classics, arts, modern languages, etc. The principal industrial features of Dollar are its many famous bleacheries on the banks of the Devon. A mile north of Dollar are the fine ruins of Castle Campbell, in a wild romantic situation on the top of a high almost insulated rock, in a hollow in the bosom of the Ochills, amid mountain rivulets and forests. It long belonged to the Argyle family. John Knox is said to have resided in the castle under the protection of Archibald, fourth earl of Argyle, the first Scotch noble to embrace Protestantism publicly. Pop. 1,807.

DOLLART, *dŏl'lĕrt*, The: gulf of the German Ocean, at the mouth of the river Ems, between Hanover and Holland. It is about 10 miles in length by 7 in breadth, and was formed by inundations of the sea, the first in the latter half of the 13th c., and the last in the 16th c. By these watery inroads a large number of villages were submerged, and thousands of persons perished.

DÖLLINGER, *döl'ĭng-ĕr*, John Joseph Ignatius von, D.C.L., LL.D.: 1799, Feb. 28—1890, Jan. 10; b. Bamberg, Bavaria: distinguished Rom. Cath. theologian, from 1871 known as the leader in the 'Old Catholic' movement. He was educated at Würtzburg, where he received holy orders For a time he was engaged in parochial duties in his native diocese; but having manifested a peculiar fitness for a literary life, he was appointed a prof. at Aschaffenburg, whence, 1826, he was removed to the chair of Ecclesiastical History in the newly-established Univ. of Munich. From the first he was distinguished as a ready and profound writer. He inaugurated his new professorial career by a work on *The Doctrine of the Eucharist during the First Three Centuries* (1826), and a *History of the Reformation*, a continuation of Hertig's *Handbook of Church History*. He subsequently undertook a new *History of the Church* (vol. I, 1833, vol. II., 1835), which was speedily translated into French, and into English, and was extended to the 15th c.; with a compendium which extended to the Reformation (1836–43). His very learned and suggestive essay on *The History, Character, and Influence of Islamism* appeared 1838, and *The Reformation, its Internal Development and Effects*, 3 vols., 1846–48. The design of this work, which consists almost entirely of extracts (connected by a very slight thread of narrative) from the writings of the leading reformers and other contemporary Protestant divines, is to present, in the words of the actors in the great religious drama of the 16th c., a picture, doctrinal, moral, social, and political, of the Reformation and its results; but as the great body of the authorities (exclusively Prot.) are German, the interest of the work is mainly national.

For a time, Döllinger undertook the chair of dogmatic theology, in which capacity he delivered lectures on 'The Philosophy of Religion,' on 'Symbolism,' and on 'Patristic Literature,' none of which, however, have been published. He was a frequent contributor to the *Historisch-politische Blätter;* he published several pamphlets on subjects of occasional interest; and was one of the chief contributors to the Rom. Cath. cyclopædia entitled *Kirchen-Lexicon*, in which his articles on Luther, on Bossuet, and on Duns Scotus attracted much attention. In the politico-religious movement of 1846–7, Döllinger was elected to represent the Univ. of Munich in the Bavarian chamber; but being deprived of his professorship, he became disqualified to sit in the chamber. In the parliament of Frankfürt, 1848, he was recognized as the leader of the Rom. Cath. party. Most of the measures of importance bearing on the relations of church and state which (however ineffectively)

were originated in that assembly were prepared or suggested by him. In 1849, he was restored to his professorship at Munich, also to his place in the Bavarian chamber, which he held till 1852. After that year, he applied himself entirely to theological literature. His work entitled *Hippolytus und Kallistus* (1853) is a masterpiece of patristic criticism: and his *Heathenism and Judaism, the Vestibule of the History of Christianity*, is a most masterly survey of the religious, moral, and social condition of the world at the advent of our Lord. It was quickly followed by *The First Ages of Christianity*, to which it had been designed as an introduction. During the early discussions on Italian unity, Döllinger delivered an address at Munich, which was represented as hostile to the temporal sovereignty of the pope. In order to explain his real opinions on that important question, Döllinger published, 1862, an elaborate work entitled *The Church and the Churches*, partly a comparative survey of the condition of the non-Rom. Catholic communions, and of the Church, and partly a *résumé* of the history and condition of the Papal States; showing that, while the temporal sovereignty was the providential means for maintaining the spiritual independence of the papacy, yet it was not essential; that the papacy long existed without it, and that even if it were overthrown, Providence would devise another means of attaining the same end. The second part was a criticism of the administration of the Papal States, which is understood to have given dissatisfaction to the authorities, as being, although well meant, inopportune, and is from this inopportuneness, unfriendly. A similar feeling is said to have been drawn forth by the part taken by Dr. Döllinger in reference to the 'Catholic Union,' some of the principles of which were supposed to trench dangerously upon the province of authority in matters of religious inquiry; but his orthodoxy and learning were unquestioned, and his influence, especially among Rom. Catholics of his own nationality, was very great until the approach of the time for the celebration of the council of the Vatican. It being understood that the doctrine of the infallibility of the pope would form a subject of discussion Döllinger was active in organizing an opposition. Articles which appeared in the *Augsburg Gazette*, 1869, March, and which were reprinted more fully under the *nom de plume* 'Janus,' were ascribed to him or to his influence; and during the discussions of the council, he was entirely in unison with the party opposed to the Ultramontane view. On the publication of the decree of the council, which defined the infallibility of the pope in all doctrinal teachings on faith and morals addressed *ex cathedra* to the universal church, Döllinger refused to accept the doctrine. In deprecation of the impending censure of excommunication by the abp. of Munich, he published in October an address to the abp., in which he claimed to be heard in the synod of German bishops, or before a committee of the cathedral chapter. His declaration on papal infallibility called forth replies from Dr.

Hergenröther and others, and was accepted, on the other hand, by the so-called Old Catholic party. Döllinger was elected rector of the Univ. of Munich (1871, Feb. 29) by a large majority of votes. Persisting in his refusal to submit to the authority of the council, he was excommunicated by the abp. of Munich 1871, Apr. 18. In 1874, Dr. Döllinger presided over the 'Old Catholic' Conference at Bonn, where he frankly declared that he and his colleagues did not consider themselves bound by the council of Trent. He also introduced a declaration, adopted unanimously, that the Eucharistic celebration in the church is not a continuous repetition or renewal of the great propitiatory sacrifice. See OLD CATHOLICS: FRIEDRICH. Works of Döllinger not mentioned above are *Past and Present in Catholic Theology* (1863); *The Fables about Popes in the Middle Ages* (1863); *Prophecies and the Prophetical Spirit; Materials for a History of the Council of Trent* (1876). In addition to his accomplishments in book-learning, Dr. Döllinger's attainments as a linguist, both in ancient and modern languages, are very remarkable. In 1871, he received the honorary degree D.C.L. from Oxford Univ.; and in 1872, LL.D. from Edinburgh. In 1872, the King of Bavaria conferred on him the order of Merit; and in 1874, the emperor of Germany the order of the Red Eagle, second class. In 1873, he was appointed pres. of the Royal Acad. of Science at Munich.

DOLLMAN, n. *dŏl'măn* [Hung. *dolmang:* Turk. *dolaman*]: a long cassock or robe worn by the Turks, and generally by the Sclave races.

DOLLOND, *dŏl'ond*, JOHN: distinguished optician, inventor of the achromatic telescope: 1706, June 10—1761, Nov. 30; b. London; descendant of a French refugee family. His father was an operative silk-weaver, in humble circumstances, and Dollond was brought up to that occupation. Engaged at the loom all day, he devoted great part of the night to studies in mathematics, optics, and astronomy. He made himself acquainted also with anatomy, and even theology, and went so far in the study of the classical languages as to translate the Greek Testament into Latin. French, German, and Italian also, he knew well. He apprenticed his eldest son, Peter, to an optician; and after Peter had established himself in business his father joined him, 1752. John Dollond now applied himself to the improvement of the dioptric telescope, and after experiments and researches, for several years, he succeeded in constructing lenses that produced images without any colored fringe. See ACHROMATIC. This was undoubtedly the greatest improvement that the telescope had received since its invention. The Memoir (published in the *Philosophical Transactions* 1758) in which he gave an account of his investigations, was rewarded by the council of the Royal Soc. with the Copley medal. In 1761, Dollond was elected a Fellow of the Royal Soc. His two sons continued the business with great reputation and success.

DOLLY-SHOP, n. *dŏl'lĭ* [comp. Gael. *diolain*, illegal]: an illegal pawnshop in London (known in Edinburgh and Glasgow as *wee pawn*), where the poor leave a humbler kind of pledges for small sums—they are supposed to be sales made, but the goods can be redeemed by a tacit understanding within a limited time; a store where rags, bones, etc., are purchased—said to have had a *black doll* as its sign or emblem.

DOLMAN, n. *dŏl'man:* a woman's cloak.

DOLMEN, n. *dŏl'mĕn*, or TOLMEN, n. *tŏl'mĕn* [Celtic]: in *archeol.*, the name in France for what British archeologists call a CROMLECH (q.v.). See TOLMEN. The Dolmen, properly so called, consists of *one* large unhewn stone resting on two or more unhewn stones placed erect in the earth. But the name is sometimes applied to structures where several blocks are raised upon pillars, so as to form a sort of gallery. One of the most remarkable monuments of this kind is the *Pierre Couvert*, about a mile and a half from Saumur. It is 64 ft. long, about 15 ft. wide, and about 6 ft. high. It has four stones on each side, four on the top, and one at each end. The stone at the east end has fallen down; all the others appear to be as originally placed. Some of them are of great size, one on the roof measuring 24 ft. in length, and more than 2 ft. in thickness. All are of the sandstone of the neighborhood. The floor is unpaved. Dolmen is believed to be a Celtic word, signifying a stone table. The monuments to which the name is given are supposed to be the sepulchres of the ancient Celts or Gauls.

DOLO, *dō'lō:* town of n. Italy, govt. of Venice; 12 m. w. from Venice, on the Brenta and Brentano. It is a station on the railway between Padua and Venice. In the vicinity are many villas of the Venetian nobility. Pop. 4,468.

DOLOMITE, n. *dŏl'ŏ-mīt* [after the French geologist *Dolomieu*]: known also as BITTER SPAR, or MAGNESIAN LIMESTONE, mineral consisting of carbonate of lime and carbonate of magnesia in somewhat variable proportions, sometimes nearly equal, the carbonate of lime often greatly preponderating; iron and manganese carbonates are sometimes present as impurities. It is softer than limestone; usually white; sometimes gray, yellow, or brown; and occurs compact, cellular, or porous, granular, foliated, and crystallized. Its crystals are usually rhomboidal, and its cleavage is rhomboidal. It is readily distinguished from limestone by its feeble effervescence in acids. It occasionally occurs in veins accompanied with quartz, calcareous spar, etc., and, as a rock, often forms strata of great extent and thickness. Many of the great limestone formations in the U. S. are more or less dolomitic.

DOLOMITE MOUNTAINS, a group of mountains, part in Tyrol and part in Italy. The name comes from the mineral dolomite, found in large quantities in these mountains.

DOLOMITIZA'TION: the process by which the calcium in limestones is replaced by magnesium, forming dolomitic limestones and dolomites. The exact nature of this process is still a matter of doubt. Dolomites cannot be formed directly from the calcareous remains of animals, since they contain a much larger proportion of magnesia than any animal shells or tests, and the magnesium therefore was probably added after the calcareous material had accumulated.

DOLOR, or DOLOUR, n. *dō'lẽr* [F. *douleur*, grief, sorrow—from L. *dolor*, grief: It. *dolore*]: pain; grief; lamentation. DOLOROUS, a. *dŏl'ŏ-rŭs*, sorrowful; doleful; dismal. DOL'OROUSLY, ad. *-lĭ*. DOL'ORIF'EROUS, a. *-rĭf'ẽr-ŭs* [L. *fero*, I produce]: producing pain. DOL'ORIF'IC, a. *-rĭf'ĭk*, that causes or produces pain or grief. DOLOROSO, ad. *dŏl-ŏ-rō'zo* [It.]: in *mus.*, in a plaintive, sorrowful style; with sadness.

DOLPH, JOHN HENRY: American painter: b. Fort Ann, N. Y., 1835, April 18; d. New York, 1903, Sep. 28. He studied at Antwerp, and in Paris, then opened a studio in New York; he was a member of the National Academy. His works include: *Season of Plenty; Who will Bell the Cat; Cat and Kittens; A Princess; Fish Commissioners; Alexander and Diogenes; The Waste Basket; A Society Lion;* and *Called to Order*. His pictures of animals, particularly cats, are best known.

DOLPH, JOSEPH NORTON, American statesman: b. Dolphsburg, N. Y., 1835, Oct. 19; d. Portland, Ore., 1897, Mar. 10. He studied law, and began practice at Binghamton, N. Y. In 1862 he settled in Portland, Ore., taking up the practice of law there. In 1864 he was elected city attorney, and was appointed United States district attorney. He was a member of the State Senate four consecutive terms, was elected to the United States Senate in 1883, and re-elected in 1889. In his second term he was chairman of the Committee on Coast Defenses, a member of the Committee on Commerce, and an active opponent of the free coinage of silver.

DOLPHIN, n. *dŏl'fĭn* [OF. *daulphin*—from Gr. *delphin;* L. *delphīnus*, a dolphin (see DAUPHIN)]: a small cetacean of several species; a spar or buoy fastened to an anchor; a mooring-post at the entrance of a dock or on a quay. DOL'PHINET, n. *-fĭ-nĕt*, a female dolphin. DOLPHIN FLY (*Aphis fabæ*): insect which infests and destroys the leaves of bean-plants. It is called also, from its color, the Collier Aphis.

DOL'PHIN (*Delphinus*): genus of *Cetacea*, type of a family, *Delphinĭdæ*, which is characterized by a moderate size of head—differing in this from the *Catodontidæ* or *Physeteridæ* (see CACHALOT)—and usually by having numerous simple and conical or nearly conical teeth in both jaws, though some of the species lose those of the upper jaw at an early age. The blow-hole is single. The family *Delphinidæ* includes, with the dolphins, porpoises, grampus, etc., many animals, which on account of their larger size

are very commonly called *whales*, as the Beluga or White Whale the Caaing Whale, the Bottlehead, etc. It contains also a few species, which inhabit not the ocean, but tropical and subtropical rivers, as the Soosoo of the Ganges and the *Inia* of the Amazon. The true dolphins have the snout prolonged into a rather slender beak, which is not only abruptly separated from the convex forehead, but even by a marked furrow. Both jaws are furnished with numerous equal teeth. The species are numerous, most of them recently discovered, and none apparently having the very wide geographical range formerly ascribed to the common dolphin (*D. delphis*), with which they were confounded. They are very voracious, and are said to prey not only on fishes, medusæ, cephalopods, etc., but even on the wounded and feeble of their own species. They live, however, in herds, which often delight the voyager in the ocean solitude by the gambols which they perform around his ship. 'They may be discerned at a great distance; as they are continually leaping from the surface of the sea, an action which, as it seems to have no obvious object, is probably the mere exuberance of animal mirth. When a shoal is seen thus frolicking at the distance of a mile or two, in a few moments, having caught sight of the ship, down they come trooping with the velocity of the wind. When arrived, they display their agility in a thousand graceful motions, now leaping with curved bodies many feet into the air, then darting through a wave with incredible velocity, leaving a slender wake of whitening foam under the water; now the thin back-fin only is exposed, cutting the surface like a knife; then the broad and muscular tail is elevated as the animal plunges perpendicularly down into the depth, or dives beneath the keel to explore the opposite side.'

The common dolphin is found in the Mediterranean and in the n. Atlantic Ocean. It is usually not more than 6 or 8 ft. long, but individuals have been seen of 10 ft. The body tapers toward the tail. The tail is crescent-shaped, and about a foot in breadth. The beak is about 6 inches long. The blow-hole is crescent-shaped, with the horns directed backward. The color is blackish on the back, grayish on the sides, and a satiny glistening white beneath. The female dolphin brings forth a single young one at a time, which she suckles and nurses with great care. Although an inhabitant of the ocean, the dolphin emits a peculiar murmuring or suppressed lowing cry. The flesh of the dolphin was formerly considered a delicacy, and sailors still regard the capture of one as a happy event.

From the form of its beak, the dolphin receives from the French the names of *Bec d'Oie* (Goose-beak) and *Oie de Mer* (Goose of the Sea). It was very differently regarded and designated by the ancient Greeks; it was their *Hieros Ichthys* (sacred fish), was invested with many fabulous attributes, and was the subject of many mythological legends. It was supposed to be peculiarly friendly to men. It was sacred to Apollo, who was worshipped at

Delphi with dolphins for his symbols. The figure of the dolphin appears on many ancient coins and medals; it is said to have been borne on the shield of Ulysses; it early appeared on the shield of some of the princes of France, and gave its name to one of the fairest of the French provinces, from which the heir-apparent of the French throne came to be styled the Dauphin. It is not easy to account for the high regard in which the dolphin was anciently held, nor to explain the general transference of its name in modern times to the coryphene, a very different creature, remarkable for those changes of color in its dying moments which poets have delighted to celebrate.

Of the other species of dolphin one only occurs, and that but rarely, in the British seas, the Bottle-nosed dolphin (*D. Tursio*), which is said sometimes to attain a length of 24 ft. It appears to belong to the northern parts of the world.

Dolphins not unfrequently enter the mouths of rivers. A dolphin of the Arctic Ocean (*D. leucas*) ascends into the fresh water of the Obi, to prey upon the ascending fishes of various kinds.

DOL'PHIN, Black (*Aphis Fabæ*): species of *Aphis* (q.v.), or plant-louse, which infests the bean, and often does considerable injury to crops, sucking the juices of the plants and preventing the development of flower-buds. It is of a dull, black, or dark-green color, the young spotted with silvery white. The first that appear are wingless, but later winged individuals are produced, and the pest spreads with great rapidity. It is in the succulent tops of the plants that the aphides first appear, and a common practice of gardeners is to remove the tops in which they are observed.

DOLT, n. *dōlt* [Swab. *dalde*, an awkward, clumsy person: Ger. *tölpel*, a blockhead: Icel. *dalpa*, to flounder in the mire: Scot. *doylt*, stupid, which see]: a heavy, stupid person; a blockhead. Dolt'ish, a. stupid; dull in intellect. Dolt'ishly, ad. *-lĭ*. Dolt'ishness, n. the quality of being stupid; stupidity. *Note.*—Skeat says, Dolt is a mere extension of OE., *dul* by the postfix *t;* prov. Eng. *dold*, stupid.

DOM, *dŏm*, or Don, *dŏn* [from Lat. *dominus*, lord]: title originally assumed by the popes, from whom it descended, in France at least, to bishops and other dignitaries, and finally to monks. In Portugal, the title *dom* is confined to the sovereign and his family. The Spanish *don* was originally confined to the nobility, but is now bestowed by courtesy as indiscriminately as the English *Mr.* or *gentleman*. The feminine *doña* is, in like manner, given to ladies: see Don.

DOMAIN, n. *dō-mān'* [F. *domaine*—from L. *domĭnĭŭm*, lordship, property—from *domĭnus*, a lord]: possession; estate; empire; dominion; the parks, etc., lying around the house of a lord, in which sense we also use *demain* and *demesne*. Doma'nial, a. *-mā'nĭ-ăl*, pertaining to: see Demesne.

DOMBEYA, n. *dŏm-bē'a* [named after M. J. *Dombey*, a French botanist]: genus of trees or shrubs belonging to the order *Byttneriaceæ*, natives of the East Indies, Madagascar, Bourbon, and the Isle of France. In Madagascar the bark of *D. spectabilis* is made into ropes. DOMBEY'EÆ, n. *-ē-ē*, tribe of *Byttneriaceæ*, type *Dombeya*.

DOM-BOC, *dŏm'bŏk*, or DOOM-BOOK, *dôm'bûk* (book of dooms or sentences, *liber judicialis*): code of laws compiled by King Alfred, chiefly from the West-Saxon collection of his own ancestor Ina, but comprising also many portions of the Kentish collection of Ethelbert, with the supplements of his successors, and of the Mercian laws of Offa. 'Ina's collection,' says Dr. Pauli, 'was the only one received entire into the Codex, which was chiefly applicable to the condition of the West Saxons. A few articles were admitted here and there from the Kentish and Mercian laws, but research into this matter is not possible, as Offa's book is lost.' Alfred made few if any original laws, but contented himself with restoring, renovating, and improving those which he found in existence. The W. Saxon dialect had become a written language earlier than any of the Teutonic dialects of the continent; and as the power of the clergy in Saxon England was more limited than elsewhere, the laws of England, till the Norman Conquest, were administered in the vernacular speech of the people. Alfred's peculiarly Christian character is strongly impressed on his code, which begins with extracts from the Bible, 'The Lord spake all these words, saying, I am the Lord thy God.' Then follow the ten commandments, the part of the Mosaic law relating to criminal offenses, and passages from the New Testament, including the golden rule. Yet these extracts prove not the *ecclesiastical*, but only the *scriptural* character of the *Dom-boc*. The code was ratified by the Witan, as Alfred expressly informs us. In addition to Dr. Pauli's life of Alfred, in two English translations, see Thorpe's Introduction to Alfred's Laws, in the *Ancient Laws and Institutes of England*, I, 58.

DOMBROWSKI, *dŏm-brŏv'skē* (properly DABROWSKI), JAN HENRYK: 1755, Aug. 29—1818, June 6; b. at Piersowice, dist. of Cracow: distinguished Polish general. He entered the service of the Elector of Saxony 1770; but in 1792, on the first symptoms of the insurrection in Poland went to Warsaw. He took part in the Polish campaigns against Russia and Prussia, and exhibited such remarkable military talent, that on the termination of hostilities, Suwarrow offered him employment in the Russian service. and Prussia made him a similar offer. Both were refused, and Dombrowski went to France, where, 1796, he was commissioned by the Directory to form a Polish Legion among his exiled countrymen, of which he was appointed commander. The legion brilliantly distinguished itself in the Italian campaign. While in Rome, the admirable discipline which Dombrowski preserved among his troops, raised him so high in the estimation of the senate, that it presented him with the standards which his great country-

man Sobieski had taken from the Turks, when he compelled them to raise the siege of Vienna, and which he had sent to the church of San Loretto. In the campaign of 1799–1800, Dombrowski showed splendid courage. After the peace of Amiens, Dombrowski became a gen. of division in the service of the Cisalpine Republic; and after the battle of Jena, with Wybicki, he was ordered by Napoleon (1806) to summon his countrymen to arms. His entrance into Warsaw, at the head of 12 Polish divisions, resembled a classical 'triumph.' At Dirschau and Friedland, he won fresh laurels. In the fatal Russian campaign of 1812, he commanded one of the three divisions of the fifth *corps d'armée*, and at the passage of the Beresina, saved from destruction the relics of Poniatowski's corps. In 1813, at the head of his Poles, he took an honorable part in the battles of Teltow, Grossbeeren, Jüterbogk, and Leipsic. After the fall of Napoleon, Dombrowski returned to Poland, and in 1815 was appointed by Emperor Alexander a gen. of cavalry and Polish senator; but in the following year he withdrew from public employment to his estate in the duchy of Posen.

DOME, n. *dōm* [L. *domus*, a house: Gr. *dōma*, a roof, a house: F. *dôme*, a dome—from It. *duomo:* Ger. *dom*, a cathedral—a church, being called the *domus Dĕī*, house of God]: the part of a roof in the form of an inverted cup or half globe; a house or building; a cupola; the upper part of a furnace when of a hollow circular shape. DOMED, a. *dōmd*, having a dome. DOME-SHAPED, in the form of a dome. DOMAL, a. *dō′măl*, relating to the astrological use of a house of the heavens,—the whole heaven, visible and invisible, having been divided by astrologers into 12 equal parts, called the 12 houses of the heavens.

DOME (Ital. *duomo*): often used synonymously with Cupola (q.v.), but in the stricter sense in the languages of northern Europe, the external part of the spherical or polygonal roof, of which the cupola (*cupo*, or cup) is the internal part. In Italian usage, however, it has a wider signification than even the first, being used to denote the cathedral or chief church of a town, *the house* (domus) *par excellence*, or house of God. The cause of the name of the building being thus applied to the form of the roof which covered it, arose from the fact, that the chief churches of Italy were at one period almost universally so roofed. In tracing the historical origin of the dome, it is usually regarded as originating with the architecture of the Eastern Empire, because it was at Constantinople and in the Byzantine provinces that it was first employed in ecclesiastical structures. But the Romans, in reality, were the inventors of the dome, as of all the other applications of the semicircular arch. Of their success in applying it to large buildings, we have abundant proof in the ancient domes still seen in Rome and its neighborhood. The dome of the Pantheon is probably the most magnificent dome in existence, and others of smaller size are in the temples of Bacchus, Vesta, Romulus, Hercules, etc. 'From Rome it

went to Constantinople, and from the same source, also, came the few insignificant attempts at domes in the Western Empire.'—Fergusson's *Handbook of Architecture*, ii. 943. The external form of the dome of the church of St. Sophia at Constantinople, which became the typical Christian structure of the kind, appears in the illustration appended to BYZANTINE ARCHITECTURE. See PANTHEON. The dome of San Vitale, at Ravenna (q.v.), is said to be still more ancient than that of San Sophia, and is a very remarkable structure of the same class. On the church of St. Marco, at Venice, there are no less than five domes, the centre one, as usual, much larger than the others. The interior of these domes is covered with Mosaic (q.v.). So far from being peculiar to the few churches mentioned, domes occur in the churches of almost every town along the w. shore of the Adriatic, and form, in fact, the chief architectural feature of this side of Italy. The construction of domes in modern times was revived in Rome, by the building of that of Our Lady of Loretto in 1507. But the three most celebrated modern domes are those of St. Peter's (q.v.) at Rome, of St. Paul's (q.v.) in London, and of the Pantheon (q.v.) in Paris. A very complete article on domes, condensed in the *Penny Cyclopædia* is in the *Encyclopédie Méthodique*, under 'Architecture.'

DOMENICHINO, *do-men-e-kē'no*, or DOMENICO, *do-měn'e-ko*, ZAMPIERI: 1581–1641; b. Bologna: celebrated painter of the Bolognese school. He began his studies under Domenichino Calvaert, and completed them under the Caracci. During the whole of his career, Domenichino suffered from the jealousy of rivals, who are not free from the suspicion of having caused his death by poison. His frescoes are distinguished by correctness of design, soft delicacy, and freshness of color; the heads of his figures, in particular, are remarkable for expressive force. The master-piece of Domenichino, the 'Communion of St. Jerome' (in the Vatican), though suggested by Ag. Caracci's, is a sublime production. The 'Life of the Blessed Virgin,' and the 'Cure of the Demoniac Boy,' are of exquisite beauty. Out of Italy the Museum of the Louvre has the largest number of Domenichino's works.

DOMESDAY, n. *dômz'dā*, or DOMES'DAY-BOOK [L. *Domus Dĕī*, the house of God, so called from the inclosure where kept—the second part of the word, viz., *day*, being a mere corruption of *Dĕī:* the origin from AS. *dom*, judgment, is less probable]: the anc. record of the survey of all the lands in the kingdom made in the reign of William I., and now in the Exchequer, consisting of two volumes, a greater and a less. The name is applied sometimes to a similar record recently completed; anciently it was a name for a register or cartulary of lands.—The popular etymology of DOMESDAY-BOOK, by the spelling *Doomsday-book*, connects it with *doom* or *dom*, judgment, and so from an AS. *domes-dæg*, the day of judgment or decision, (1) because the great AS. proprietors were dispossessed of their ancestral lands by William I., who bestowed them on his

Norman followers, (2) because it was a book from which *dooms* or decisions were given in all litigations about land.

The survey was made by commissioners called the King's Justiciaries, who seem to have had the help of the chief men of every shire. By a sworn assize or jury of the sheriffs, lords of manors, presbyters of churches, reeves [i.e., grieves or overseers] of hundreds, bailiffs, and six villeins [i.e., tenants at will] of every village, they made inquest as to the name of the place; who held it in the time of King Edward (1041–66); who was its present possessor; how many hydes there were in the manor; how many plowgates in demesne [i.e., reserved in the lord's own hand]; how many homagers or vassals; how many villeins; how many cottars; how many serfs; what free-men; how many tenants in socage [i.e., tenants by hereditary right]; how much wood; how much meadow and pasture; what mills and fish-ponds; how much had been added or taken away; what was the gross value in King Edward's time; what was the present value; and how much each free-man or soc-man has or had. Of all this there was to be a threefold return or valuation: 1. As the land was held in King Edward's days; 2. As it had been given by King William; 3. As it stood at the time when the survey was made; and the jurors were to say further whether the value could now be raised.

The returns thus gathered in the several shires, and their hundreds and other subdivisions, were arranged and digested in the record now called the Great or Exchequer Domesday.

DOMESTIC, a. *dō-mĕs'tĭk* [F. *domestique*—from L. *domestĭcus*, belonging to the house—from *domus*, a house: It. *domestico*]: pertaining to one's home or family; remaining much at home; private; tame; not wild; not foreign: N. a servant living in a family. DOMES'TICALLY, ad. *-lĭ*. DOMES'TICATE, v. *-tĭ-kāt*, to make at ease as if at home; to familiarize; to accustom to remain at home; to tame or reclaim from a wild state. DOMES'TICATING, imp. DOMES'TICATED, pp.: ADJ. fond of remaining at one's own home. DOMES'TICA'TION, n. *-kā'shŭn*, the taming of wild animals; the act of living much at home. DOMESTICITY, n. *dō'mĕs-tĭs'ĭ-tĭ* [F. *domesticité*]: domestic character. DOMESTIC BOILER, n. one for heating water on a somewhat large scale for the household. It forms a permanent attachment to the stove.

DOMES'TIC AN'IMALS: those which, in order to turn them to his use, man has tamed or reduced in a greater or less measure from their natural wildness, and which he makes the objects of his care, and his property. Many animals are useful to man, which he has never appropriated. Of mammals, those domesticated are exclusively of the common quadruped form, and mostly herbivorous. The greatest number, and these among the most important, belong to the order of ruminants; some of them valuable for their flesh, their milk, their hair or wool, their hide; etc., or as beasts of burden and of draught, some on all

these accounts. To this order belong the ox, buffalo, and yak, the sheep, the goat, the reindeer, the camel, and the llama and alpaca. Of other herbivorous quadrupeds, most important are the horse and ass, the elephant and the hog. Of the elephant, however, though for many ages it has been much employed for various purposes in India, no domesticated race exists; the individuals which man reduces to his service, being still taken as at first from among the wild denizens of the forest. Domesticated races exist of two comparatively unimportant quadrupeds of the order of rodents, the rabbit and the cavy or Guinea-pig.—Of carnivorous quadrupeds, there are only two generally and thoroughly domesticated, the dog and the cat. The uses to which these animals are applied are very different from those in order to which herbivorous quadrupeds are kept in a domestic state. Analogous to one of the uses of the dog is that to which the cheetah or hunting-leopard is applied by some of the princes of India, but like the elephant, it is only individually domesticated. The same remark may be made concerning some other animals—the otter, the civet, etc.—which in different countries are tamed or kept in confinement for certain purposes. The domestication of the ferret is rather more complete.—Of birds, the most important domestic species belong to the gallinaceous order, and to the family *Anatidæ* among web-footed birds. To the former belong the common domestic fowl, the turkey, the peacock, the Guinea-fowl, etc.; to the latter, the goose, duck, etc. Of other birds, none can be said to be truly domesticated, except, perhaps, one or two species of song-birds, particularly the canary. The birds used in falconry are domesticated only in the same sense as the cheetah; but it is worthy of note that man has been able to make both birds and beasts of prey his servants.—Reptiles are quite capable of being tamed, and in some countries some of them are occasionally kept in houses for killing flies, or even for killing mice and rats; but none of them can be enumerated among domestic animals. Nor, perhaps, can any species of fish, be so regarded, although artificial ponds have long been in use, and some species of fresh-water fish are to a certain extent the objects of care and of a kind of culture on the part of man.—In the lower divisions of the animal kingdom, only a few species ever receive such culture, or in their living state are claimed by man as his property. All these belong to the class of insects—viz. two or three species of bee, two or three species of silk-worm moth, and two or three species of cochineal insect. These may be more fitly described as *cultivated* than as *domesticated*.

Many animals not yet domesticated, might probably be added with advantage to the number of domestic animals. Adaptation to particular climates and situations might probably be found to recommend species allied to those in which great part of the wealth of mankind has long consisted, and from which still more of it has been derived. It is not impossible, also, that as the waste places of the world become peopled, animals already becoming scarce,

may be advantageously domesticated on account of their fur or other products for which they are now pursued by the hunter.—The principal domestic animals, however, of the present day, have been domestic animals, and highly valued as such, from time immemorial. We have no record of the domestication of the ox, the horse, the camel, the dog, the cat, etc. Even the llama and alpaca, though known only to the inhabitants of the Andes and adjacent regions, were found in a state of domestication there when S. America was first visited by Europeans, and their subjection to man is probably to be referred to the earliest periods of Peruvian civilization. The limitation of some domestic animals to particular countries and climates—of which we have notable instances in the camel of the Asiatic deserts, the reindeer of the arctic regions, the yak of the steep and snow-clad Himalaya, the buffalo of tropical marches, and the S. American quadrupeds above mentioned—forbid us to suppose that all the important domestic animals were domesticated by the same people and at the same period, or that they have all spread in a state of domestication from a common centre or source. Yet there are many circumstances which point to the same Asiatic region as that in which the greater number of them were first domesticated, which is commonly regarded as the cradle of the arts and sciences, and even of the human race.

DOMESTIC ARCHITECTURE: constructive art applied to dwellings. The external forms and internal arrangements of the domestic abodes of a people are far more influenced by their manners, habits, and occupations, and by the climate in which they live, than their ecclesiastical edifices and public buildings; and there is, consequently, no department of architecture so varied and national as domestic architecture. But not only are the circumstances of each country different in this respect; the same is the case with different departments of each country, with various towns in each department, with the streets in each town; and a domestic architecture which fulfils its object, will not only adapt itself to the necessities, but will make the best, in artistic effect, of the specialties of every case with which it is called to deal. The circumstances of families, and even the tastes and fancies of individuals, are legitimate subjects of consideration in domestic architecture. To attempt to give to domestic architecture the beauty of uniformity, is consequently to mistake both its object and the source of its charm. When attained at all, uniformity is attained usually not in accordance with, but in defiance of, the utilitarian objects of domestic architecture. The results of this artistic falsehood may be seen in the monotonous and meaningless streets and squares in many principal modern towns. The legitimate charm of domestic architecture, because the only one which can arise from the complete fulfilment of its object, is the charm of variety. It is the charm which our ancestors sought during the whole of the great architectural period of the middle ages, and which recent architects, who in this, as in so many other respects, are returning to their principles, are

beginning to cultivate. Yet, in general, it is the principle alone that can be revived, and the details can be legitimately copied only in the exceptional cases in which circumstances and the objects to be attained remain unchanged. To construct for the citizen in the 19th c. a house in all respects resembling that constructed for one in the 14th would be an error the same in kind as to construct for either of them a model dwelling in Pompeii or Canton.

An account of the forms of English houses since the 12th c., will be found in Parker's *Glossary of Architecture*. Apart from our own earlier examples, the forms of domestic architecture most suggestive for present use in this country, are those which are found in such wonderful beauty and variety in almost all the older continental towns of the north of Europe. It was from the domestic architecture of France and the Netherlands that that of Scotland, at its best period, was mainly borrowed.

DOMETT, *dŏm'et*, or DOMETS, n. *dō-mèts'* [unascertained]: a loosely woven black or white material, resembling thin flannel, whose weft is of wool, and warp of cotton.

DOMICILE, n. *dŏm'ĭ-sĭl* [F. *domicile*—from L. *domĭcĭlĭum*, a habitation—from *domus*, a house: It. *domicilio*]: a house; a residence; the usual place of abode: V. to fix for one's self a permanent residence. DOM'ICILING, imp. DOM'ICILED, pp. *-sĭld*. DOM'ICIL'IARY, a. *-sĭl'ĭ-ĕr-ĭ*, pertaining to the residence of a family or person. DOMICILIARY VISIT, a visit paid to a house by authority to search for persons or things. DOM'ICIL'IATE, v. *-sĭl'ĭ-āt*, to domicile; to make quite at ease as in one's own home. DOM'ICIL'IATING, imp. DOM'ICIL'IATED, pp. DOM'ICILIA'TION, n. *-ā'shŭn*, permanent residence.—SYN. of 'domicile, n.': abode; mansion; habitation; home.

DOM'ICILE, in Law: a man's place of abode which the law will hold to be his residence. In determining questions of D., so often surrounded by difficulties, the law endeavors to follow the facts of each case, and, consequently, the legal as well as the natural view of the matter is expressed in that definition of a D. in the English code which says, 'every man has his domicile where he has placed his hearth and centred his fortunes, whence he goes not forth without an occasion, from which, when he is absent, he is said to be abroad, and to which, when he returns, he is said to cease to be abroad.'—Cod. 10, tit. 40, s. 7. Even in Rome, questions of D. were important, for the empire was divided for purposes of domestic government, and the inhabitant of one province was not subject to the magistrates of another. But it was in modern times, when Europe was divided into many independent kingdoms, and America was formed out of states having different local customs and laws, that the law of D. assumed its full importance. It now constitutes one of the most difficult branches of private international law (q.v.). The following are its most general rules: 1. The place of birth is the original D. of every one, provided that, at the time of his birth, it was the D. of his parents; but if his parents were then on a visit or on a jour-

ney, the home of the parents will be the D. of birth, nativity, or origin (*domirilium originis*). 2. If the child is illegitimate, it follows the D. of its mother. 3. The D. originally obtained continues till a new one is acquired; unless lost by non-residence, under the provisions of a statute, as in the case with paupers in some countries. 4. Minors are generally deemed incapable of changing their D. of their own accord, but it may be changed by a change in the D. of the parents, or of the father, which it follows. 5. If the father dies, his last D. is that of his widow and children. 6. A wife takes the D. of her husband. 7. The place where a man lives, if there be no ground for entertaining an opposite presumption, is his D. 8. If a person of full age, having a right to change his D., takes up his abode in a new place, with the acknowledged intention of remaining permanently fixed there (*animo manendi*), that place immediately becomes, and that which he has quitted ceases to be, his D. The definite intention of remaining, or of returning, is requisite to establish a D. Temporary absence, however long continued, if there be definite intention to return, does not vacate a D. The law favors the presumption of a continuance of D. Questions as to what amounts to intention, or what circumstances constitute sufficient proof of intention of remaining, or quitting a place of residence, are among the most difficult in the law of D. Most persons who are resident abroad have a sort of floating notion that, in certain conceivable circumstances, they would return to their native country, and to these vague feelings they give expression in a manner more or less vague. Not enumerating other effects of the law of D., it may be stated generally, that it regulates the succession to personal or movable property, which is said to follow the person, and must be distributed after death according to the law of the country of which the deceased died a domiciled citizen. Heritable or real property descends in accordance with the law of the land in which it is situated (*lex rei sitæ*). A divorce valid under the law of the D. of both parties is valid everywhere: see DIVORCE: MARRIAGE.

DOMINANT, a. *dŏm'ĭ-nănt* [F. *dominant*—from L. *domĭnans* or *domĭnan'tem*, ruling or bearing sway—from *domĭnus*, a lord: It. *dominante*]: having the power or rule; possessing the ascendency; prevailing: N. in *music*, the note which is a fifth from the tonic—thus, if the key or tonic be C, the dominant is G. DOMINANT TENEMENT: see SERVITUDE —DOM'INATE, v. *-nāt* [L. *domĭnātus*, having the power to rule over]: to prevail; to rule; to govern. DOM'INATING, imp. DOM'INATED, pp. DOM'INA'TION, n. *-nā'-shŭn* [F.—L.]: arbitrary authority; tyranny; insolent rule. DOM'INATIVE, a. *-tĭv*, arbitrary; governing. DOMINATOR, n. *dŏm'ĭ-nā-tĕr*, a predominant power or influence: an absolute governor. DOMINION, n. *dō-mĭn'yŭn* [mid. L. *dominĭōnem*]: supreme power or authority; territory or district governed by a prince; rule; control. DOM'INEER', v. *nēr'* [F. *dominer*, to govern]: to tyrannize over; to rule over with insolence; to use authority oppressively. DOM'INEER'ING, imp.: ADJ. ruling over with insolence and tyranny·

using authority oppressively. DOM'INEERED, pp. *-nērd.* — SYN. of 'dominant, a.': governing; ruling; predominant; ascendant;—of 'dominion': country; region; tract; district; territory; government; authority; sovereignty; empire; predominance; preponderance.

DOM'INANT, in Music: the fifth above the tonic: the ruling or governing tone of the key. Ancient writers called the dominant the *quinta toni*, from its being the next in importance to the tonic. The dominant chord is always a major chord, the third being the *subsemitonium modi*, or leading note, which always rises a semitone to the tonic. The dominant seventh is the major chord with the flat seventh above the dominant, and is the same in major and minor keys. The rules for the treatment of the dominant seventh, and for the chord of the ninth on the dominant, apply to all other chords of the seventh or ninth, which arise from the other degrees of the scale. The dominant seventh is a most important chord in modulation. The resolution of the dominant seventh is always into the chord of the tonic, when not interrupted. The dominant as a key is the nearest in relation to the tonic. Modulation into the key of the dominant is so frequent in composition that its form may be said to be stereotyped. The subdominant, or under dominant, stands next in importance to the dominant, and has its place on the fourth above the tonic, or, which is the same, on the fifth below. The chord of the subdominant is major or minor, according to the mode of the key. The chords on all other degrees of the scale, being either minor or diminished, give greater importance to the major chords of the tonic, dominant, and subdominant, in which chords all the notes of the scale are found, while the combination of these chords, giving the most perfect impression of a key, may account for their being of such importance in harmony.

DOMINGO, SAN or SANTO: the e. republic on the island of Hayti: see DOMINICAN REPUBLIC. The name applied sometimes to the whole island: see HAYTI.

DOMINGO, *dō-mēng'gō*, SAN or SANTO: city, cap. of the Dominican Republic: see SAN DOMINGO.

DOM'INIC, SAINT: see DOMINICANS.

DOMINICA, *dŏm-ĭ-nē'ka* (Fr. DOMINIQUE, *dŏm-ĭ-nēk'*): British W. India island in the Leeward group of the Lesser Antilles, between the French islands Martinique and Guadaloupe; lat. 15° 18′ n., and long. 61° 24′ w.; about 291 sq. m. Dominica is of volcanic origin, hot and sulphurous springs still attesting the fact. It is the loftiest of the Lesser Antilles, attaining, at one point, an elevation of 6,234 ft., and nearly one-half of the surface consists of precipitous mountains and deep ravines. Its rugged and broken character, picturesque to the artist, is disadvantageous to agriculture. Where capable of cultivation, the soil is fertile; and, even on apparently inaccessible sites, the emancipated negroes have successfully established provision grounds. The principal productions are sugar, coffee,

cocoa, cotton, lime juice, molasses, rum, tamarinds, sulphur, indigo, rosewood, and other cabinet woods. The annual value of imports, formerly $280,000 to $325,000, and of exports, formerly $325,000 to $500,060, has decreased, and is now in each case about $250,000. The cap. and chief port is Roseau, or Charlotteville, on the w. coast: pop. 4,500. It is reported that 1,000 Caribs are still living secluded in the mountains of the interior. In 1880 there was a great (and rare) eruption of volcanic ash from the dormant crater of the Grande Souffrière Mountain at the s. end of the island. Since 1872 Dominica is a member of the Leeward Islands colony, and sends representatives to the general legislative council; but it has its own president, treasurer, and local legislature. Though the majority of the inhabitants are Rom. Catholics, the clergymen of the Church of England were till lately paid from the public funds; there is now religious equality. The abolition of slavery (decreed 1833 and taking full effect 1838) is admitted by all parties to have worked well, the emancipated slaves having been peaceable, prosperous, and contented. The temperature, according to season and altitude, ranges from 88° F. down to chilliness; and even in the dry months, Feb. to Aug., rain frequently falls; annual rainfall 83 inches. Dominica was discovered by Columbus, on his second voyage, 1493, on a Sunday (whence its name Dominica, i.e., the Lord's Day). It was then thinly inhabited by Caribs. In the 17th c., and part of the 18th, it may be described as a neutral island; but 1759 it was captured by England and 1763 ceded by France. Again it was French 1768–83, and 1802–14; since then it has been English. See Froude, *The English in the W. Indies* (1888). Pop. (1901) 28,894.

DOMINICAL, a. *dō-mĭn'ĭ-kăl* [F. *dominical*—from L. *domĭnicālĭs*—from *domĭnus*, master, lord]: that notes or marks the Lord's Day. Dominical Letter, or Sunday Letter, in *almanacs*, the letter which denotes the Lord's Day, the first seven of the alphabet being used for that purpose. The first seven days of the year being marked in their order by the seven letters, A, B, C, D, E, F, G, in their order, then the following seven days, and all consecutive sets of seven days to the end of the year, are similarly marked: so that the 1st, 8th, 15th, 22d, etc., days of the year all are marked by A; and the 2d, 9th, 16th, 23d, etc., by B; and so on. The days being thus marked, it is evident that on whatever day the first Sunday of the year falls, the letter which marks it will mark all the other Sundays in the year, as the number of the letters and of the days in the week is the same.

As the usual year consists of 52 weeks and one day over, the dominical letters go backward one day in every such year. If the dominical letter of a common year be G, F will be the dominical letter for the next year. As a leap-year consists of 52 weeks and 2 days, the letters go backward two days every leap-year. If in the beginning of a leap-year the dominical letter be G, E will be the dominical

letter for the next year. This special retrocession, however, is made to take place at the intercalary day (Feb. 29) by the artifice of marking it by the same letter as the day preceding it, and thus the next Sunday is marked by the letter preceding that which marked the Sundays before the intercalary day. Suppose Feb. 28 in a leap-year to be a Sunday and marked by F, it is evident that the dominical letter for the rest of the year will be E. As every fourth year is a leap-year, and the letters are seven in number, the same order of letters must return in four times seven, or 28 years, which would, but for the leap-years, recur in seven years; hence the Solar Cycle (see PERIOD). The dominical letters were first introduced into the calendar by the early Christians, to displace the nundinal letters in the Roman calendar. They are of use as a means of discovering on what day of the week any day of the month falls in a given year: see EASTER. Rules and tables for finding them are given in prayer-books, breviaries, etc., as well as in works on dates: see DATE: CALENDAR: CHRONOLOGY.

DOMINICAN REPUB'LIC, *dō-mĭn'ĭ-kan*, or SAN (or SANTO) DOMINGO: state formed of the Spanish or east section of Hayti (q.v.), comprising more than two-thirds of the whole island; 20,587 sq. m.; cap., San Domingo (q.v.). —Spain, in 1697, surrendered to France, by the treaty of Ryswick, the w. part of the island, retaining the remainder till 1795, in which year, however, the Spanish portion became nominally French. In 1814—the west having vindicated its independence—France formally relinquished, in favor of Spain, all claim to the east. In 1822 the colony, in imitation of the continental, possessions, threw off the yoke of Spain, to link itself, more or less closely, with the neighboring state populated by Africans. But, about 1843, it assumed a separate standing as the Dominican Republic, the anarchy of which it exchanged, 1861, for the despotism of its former Spanish masters. But in 1863 it again revolted against this harsh rule, and Spain gave up the possession, and the republic has since maintained a troubled existence under a succession of govts. coming into power by revolution. The religion of the state is Rom. Cath., others being tolerated. Spanish is mostly spoken. The great majority of the people are mulattoes and negroes. Though civilization has not reached a high grade, recent years have seen much improvement; and agriculture and commerce are beginning to advance under American influence.

Political Divisions.—The country is divided into six provinces and five maritime districts, each administered by a governor appointed by the president; the governors, in turn, appoint the prefects who preside over communes, cantons, and sections.

Topography and Physical Geography.—The Mountains—the centre and culmination of the Great Antillean uplift—form several cordilleras or roughly parallel ranges. The highest peak, Mount Tina (10,300 feet) is northwest of San Domingo city, and near the centre of the island are

numerous peaks from 8,000 to 9,000 feet high. While the enormous mass of these mountains occupying four-fifths of the island, renders much of the territory nearly inaccessible, between the ranges lie plains, some of which are wonderfully fertile.

Forests.—Cedar, lignum vitæ, mahogany and other cabinet woods, as well as timber used in house- and ship-building are taken from the forests, which also produce log-wood, fustic, etc., the most luxurious growths, however, have no present commercial importance, because adequate means do not exist for bringing them from the interior regions to the coast.

Agriculture.—In the south and west are the principal sugar plantations; the area of tobacco in the north and some parts of the uplands of the interior; coffee grows readily in the mountain regions; and in the district of Barahona, its production on a large scale has begun; the cultivation of cocoa, like that of sugar cane, has increased rapidly since about 1885; cattle raising also receives a little more attention than formerly was the case; tropical fruits, especially bananas, flourish nearly everywhere.

Exports and Imports.—An official résumé of the exports through the custom-houses of the republic during the first half of 1902 shows the values of the principal articles of export to have been as follows:—sugar, $1,962,814.18; cacao, $750,530.32; coffee, $188,500.00; bananas, $37,836.50; wax, $34,636.49; leaf tobacco, $26,974.07; goatskins, $22,051.56; ox-hides, $20,313.04; campeche wood, $10,730.00; mahogany logs, $8,217.52; guayacán, $7,078.32; honey, $5,056.00; divi-divi, $4,176,00; espinillo wood, $2,701.45; live animals $2,691.00; bera, $1,971.50; mahogany forks, $1,570.00; sisal rope, $1,419.40; and, less than $1,000 each; raw cotton, deer horns, yarey fibre, caya wood, cedar, tortoise shells, moss, molasses, mora wood, rum, and sole leather. The total value of exports in 1901 was $5,190,036.64. Of imports, the total value in ordinary years is somewhat more than one-half that of exports, the large items being cotton goods, hardware, and provisions.

Railways and Transportation.—There is a railroad 72 miles in length, connecting Puerto Plata on the n. coast with Santiago, and another line to furnish transportation from Samaná Bay to Santiago has been built to a point beyond La Vega. There are 430 miles of telegraph, and 51 post-offices. The difficulties of communication between the various districts of the country, primarily due to the cordilleras, are in part attributable to the government's neglect to build good highways—without which peace will never be assured. Several concessions for railways were granted in 1901. The republic has regular communication with America and Europe by means of the lines of steamships calling at its ports. Pop. No accurate census of the population has ever been taken, but the most reliable estimates place it at a little more than 600,000,

DOMINICANS, n. *dō-mĭn'ĕ-kānz:* religious order of preaching friars in the Rom. Cath. Church (*Fratres prædicatores*), founded at Toulouse 1215 by Dominic (Domingo) de Guzman.

St. Dominic (1170–1221) was born at Calahorra, in Old Castile, studied theology at Palencia, and 1199 became canon and archdeacon of Osma in Castile. In 1205, with his superior, Diego de Azebes, Bp. of Osma, he began to itinerate through the south of France, for the purpose of converting the 'heretical' Albigenses; and convinced that the ignorance of the people and the worldliness of the clergy were great helps to the progress of heresy, he instituted the order which bears his name, for the express purpose of preaching and the cure of souls, in which good work he engaged with fervent zeal. Dominic, however, found it impossible to convert the Albigenses by this method, and unfortunately was incited to another. In 1208, incensed by the murder of his legate, the pope proclaimed a crusade against these 'heretics;' the barons of France were summoned to take part in it, and headed by De Montfort, committed horrible slaughter on these unfortunate people—Dominic acting as prosecutor and proving 'heresy' on the miserable victims of the crusade.

The order of the Dominicans was confirmed by Innocent III. and Honorius III. 1216. The members followed the rule of St. Augustine, somewhat modified. In 1220 they took the vow of poverty. Dominic died at Bologna 1221, and was canonized by Gregory IX. 1233: his festival is on Aug. 4. He is said to have been ordinarily not a cruel or unfeeling man, but his religious passions were so vehement that they entirely dried up the milk of human kindness in his heart, and his conduct toward heretics was merciless in the extreme. As early as 1206 he founded an order of Dominican nuns, which, after 1218, when the first convent was established at Rome, spread far and wide. These nuns followed the same rule as the friars, and were solemnly pledged to habits of industry. A *third* Dominican order (men and women under *simple* vows) was established 1224, and confirmed 1279. It was originally the Knights of Christ, a company of knights and nobles who had leagued themselves together for the suppression of 'heresy' by force of arms, but after the death of its founder, the order was changed into that of the *Penitents of St. Dominic.* The members of this branch of the Dominicans were called also the Tertiary Dominicans. They were not bound by any vows, but their special duties were to observe particular fasts and devotions, and to execute great ecclesiastical judgments. They retained all their civic and domestic privileges. There were also *female* Penitents of St. Dominic, a few of whom, however, betook themselves to a conventual life, and became nuns. These few were chiefly in Italy; the most famous was St. Catharine of Siena. The glory of apostolic poverty which encircled the Dominicans, the privileges which they possessed—especially of preaching and hearing confession—and the circumstance that as early as 1230 they secured a chair of theology in the Univ. of Paris, all helped to rapid increase of their numbers

and influence. Within *six* years after their establishment, they had spread to England through one Gilbert du Fresney, and founded a monastery at Oxford. 'The monks,' writes the contemporary annalist, Matthew Paris, himself a Benedictine, 'did not, in three or four hundred years, ascend to such a height of greatness as the friars minors, and preachers, within twenty-four years after they began to build their first house in England.' Their progress was scarcely less rapid in Scotland, where they found a munificent patron in King Alexander II., who is said to have met St. Dominic at Paris about 1217. In Britain, the Dominicans were called the *Black Friars*. In France, they received the name of Jacobins, from the Rue St. Jacques (Lat. *Jacobus*) in Paris, where first they established themselves. Their monasteries arose throughout Christendom, and even on the shores of Asia, Africa, and subsequently America. Their monarchical constitution, which bound all the branches and congregations of the order under one grand head (*magister ordinis*), insured their progress and the co-operation of their efforts to secure influence in church and state. Through their preaching and proselytizing, it is undeniable that they exercised, at the time of the foundation of their order, and for a considerable time afterward, an influence alike extensive and beneficial. They have produced several great scholars and men of genius, such as Albertus Magnus; Thomas Aquinas, the normal theologian of the Rom. Cath. Church; and Raymund de Pennaforte. They have, however, a black reputation in history in connection with the Inquisition (q.v.), in which they were the chief agents. After 1425, when they obtained permission to accept endowments, they in some measure refrained from begging, and engaged themselves more with politics and theology. Their great rivals were the *Franciscans* (q.v.), and the mutual animosity of the two orders was strongly exhibited in the disputes of the Thomists and Scotists. These two orders divided between them the honor of controlling the church, and often the Rom. Cath. states of Christendom, until the rise of the Jesuits in the 16th c., who gradually drove both from the schools and the court, when the Dominicans were compelled to return to their original vocation. Their power was, however, again revived to a certain extent in 1620, when the censorship of books was conferred on the 'Master of the Sacred Palace,' who must always be a Dominican. In the 18th c., the order of Dominicans possessed 1,000 monasteries and convents, divided into 45 provinces, besides 12 separate congregations or sects. At present, the order flourishes only in Italy, France, Hungary, Switzerland, and America. The Dominican nuns, who are not numerous, have convents in Italy, France, Belgium, Hungary, Bavaria, and the United States.

DOMINIE, n. *dŏm'ĭ-nĭ* [L. *dŏmĭnus*, lord, master]: in *Scot.*, a schoolmaster; a pedagogue. A colloquial application of the term to a clergyman is frequent in those parts of N. Y. and N. J which were early settled by the Dutch.

DOMINION OF CANADA: see CANADA.

DOMINIS, *dom'e-nēs*, Marcus Antonius de 1560–1624, Sep.; b. Arba, on the coast of Dalmatia; ecclesiastic whose career was singular and checkered. He was educated, first at Loretto, then at Padua, where he greatly distinguished himself by his ability and varied studies. While at Padua he taught mathematics, physics, and eloquence. Having completed his theological curriculum he was, after some time, appointed bp. of Segni, and two years later, abp. of Spalatro, in which capacity, however, he quarrelled with the pope, and having, moreover, exhibited certain Prot. leanings, he found it expedient to resign his post. In 1616, he came to England where he was hospitably received. King James appointed him Dean of Windsor; and while holding this office, he wrote his *De Republica Ecclesiastica*, a work in which he endeavored to show that the pope had no supremacy over other bishops, but was only *primus inter pares*. Dominis published one or two other productions 1617–18; but finding Anglicanism far from satisfactory, a revulsion of feeling occurred, and Dominis once more looked and longed for the unity of the church catholic. The motives that induced his reversion to the Church of Rome are not known. Most writers consider that he was actuated by avarice and ambition, but a critical appreciation of his character makes doubtful this harsh judgment. He was, it has been supposed, desirous of discovering a church broad enough to form the basis of a universal Christianity. Men holding such opinions are always misunderstood, and so Dominis, even after his return to Rome, was still suspected of heresy. In consequence, he was imprisoned in the castle of St. Angelo, where he died. Being subsequently condemned as a heretic, his body was raised from its grave, and burned.

While at Padua, Dominis wrote his *De Radiis Visus et Lucis in Vitris Perspectivis et Iride* (Venice, 1611). He was the first to point out that in the phenomenon of the rainbow, the light undergoes, in each rain-drop, two refractions and an intermediate reflection.

DOMINIUM, *dō-mĭn'ĭŭm:* Roman law-term, equivalent to real ownership; a full legal right in and to an object, as

the right from which alone legal possession could flow, but which possession alone could never confer. The right to possess is thus distinguished from the right arising from possession, which is the usufruct. Dominium, or ownership, may be absolute and include the beneficial interest in the subject, or it may consist in a limited power over it at the time, or some ultimate right to it at a future time. Dominium has a totally different meaning from Imperium (q.v.).

DOMINO, n. *dŏm′ĭ-nō* [F. *domino*—from Sp. *domino*, a black hood worn by priests, originally by a master—from L. *domĭnus*, a master]: outer mantle or cloak with wide sleeves and a movable hood, used at masquerades (see MASQUERADE); formerly the name was given to the outer garb of priests officiating in winter in cold edifices. DOM′INO, n. *-ĭ-nō*, DOM′INOES, n. plu. *-nōz*, game usually played with 28 oblong, flat tablets of ivory or bone, etc., each of which bears two numbers marked by points from nought to six. The tablets, backed with black, have, so far, a resemblance to a domino. The party wins who has first played out his tablets, or, if this has been found impossible, who has the fewest points on the tablets still remaining. Attempts have been made to trace the game back to the Greeks and Hebrews, and to the Chinese. It is certain that it was introduced about the beginning of the 18th c. from Italy into France, where it immediately became popular in the larger towns. From Paris it spread to Germany, where, as in France, it is now played in every coffee-house. The Café de l'Opera, in Paris, long boasted of assembling the most expert players; an honor warmly contested by the establishments of Rouen and Poitiers.

DOMINUS, *dŏmĭ′-nŭs:* Latin word which we commonly render lord, but which more properly signifies master, as opposed to slave (*servus*). Aurelianus is said to have been the first emperor who adopted dominus as a title of honor on his medals, though it had long been made use of in conversation and in correspondence in that sense, as by Pliny in addressing Trajan. In legal phraseology, the *dominus litis* is the person really interested in the issue of an action, though not necessarily the pursuer.

DOMITE, n. *dō′mīt:* a granular arenaceous-looking variety of trachyte found in the Puy-de-*Dôme*, France.

DOMITIANUS, *dō-mĭsh-ĭ-ā′nŭs*, T. FLAVIUS, Emperor of Rome: died A.D. 96, Sep. 18 (reigned 81–96): son of Vespasian, and younger brother of Titus, whom he succeeded on the throne. The earlier years of his reign were on the whole advantageous to the public. Many good laws were passed, the provinces carefully governed, and justice was rigidly administered. As he grew older, however, his ambition, his jealousy, and his pride, wounded by the failure of his campaigns against the Dacians and the Marcomanni in 87, began to instigate him to the most atrocious cruelties. By murder or banishment, he deprived Rome of

nearly every citizen conspicuous for talent, learning, or wealth. To win the army, he greatly increased the pay of the soldiers, and secured the favor of the people by prodigal largesses and gladiatorial shows and games, in which he sometimes took part in person. His cruelties became at length so intolerable, that a conspiracy—encouraged, if not organized—by his wife Domitia, whom he had doomed to death, was formed against him, and the tyrant fell under the dagger of the assassin.

DOMUS, CONVERSORUM: A home founded in London in 1232 by order of Henry III. to shelter and maintain Jewish converts. The present rolls office in Chancery lane occupies the site of the old buildings and chapel. The institution was suggested by the clergy, who appointed a chaplain as teacher. It is estimated that until 1290, when the Jews were expelled from England, about 100 received the benefit of the home, out of 16,000 Jews in the Kingdom. Besides the grants from the royal treasury and episcopal bequests, the home received a poll-tax or 'chevage' which all Jews above the age of twelve had to pay to support their converted brethren, eighty of whom were in the home at the period of expulsion. Exact details, preserved in the MSS. of the rolls office tell of the names of converts, their numbers from time to time, receipts by them for money paid, etc., which show that Jews entered England after their formal banishment. Their numbers were small—from 1330 to 1393 only twenty were admitted; in 1400 there were only two inmates; in 1450, five; in 1500, four; from 1551 to 1578, the home was empty. In 1598, an inmate entered who had taught Hebrew at Oxford, Cambridge and Leyden. The records which close in 1608 show that from 1331 to 1608 thirty-eight men and ten women were inmates. The whirligig of time brought its revenges when in 1873 Sir George Jesoel, an observant Jew, became master of the rolls, which in an earlier age was associated with the office of Warden of the Domus Conversorum; whose last trace disappeared by an act of 1891.

DON (anc. *Ta'nais*): river of Russia, having its course in a small lake in the govt. of Tula, lat. about 53° 45′ n., and long. 38° 10′ e. It flows at first s.e. through the governments of Tula, Riazan, Tambov, and Woronetz, and after winding s.w. through the country of the Don Cossacks, it advances on its embouchure in the Sea of Azov, which it enters by three mouths, only one of which is navigable. The Don receives the 80 affluents, of which the principal are the Sosna and the Donetz on the right, and on the left the Khoper, the Medvieditza, the Sal, and the Manitch. Its total length is about 1,150 m. Its course is obstructed by frequent sand-banks, which, when the water is low, render navigation impossible to any but flat-bottomed boats. From April to June, however, during which months it overflows its banks, and forms unwholesome swamps on either side, it is navigable as far up as Zadonsk, 600 m. The Don is connected by a canal with the Volga

and by this means the produce and the manufactures of the interior are conveyed to the southern provinces of Russia. The waters of the Don abound in fish, the traffic in which commodity is considerable, especially in its lower course.

DON river of Aberdeenshire, Scotland, rising on the w. border of the county in a peat-moss, 1,640 ft. above the sea. It runs n.e., then e., and lastly s.e., entering the sea a mile n.e. of Old Aberdeen. It has a total course of 78 m., but only 42 in a straight line, and it drains a tract of 495 sq. m., chiefly of granite and gneiss, with a little syenite and clay-slate. Its chie tributary is the Ury. Near the junction of the Ury and Don is a curious conical gravel hillock, called the Bass, the subject of a prophecy by Thomas the Rhymer. The Don, at less than a mile from the sea, is crossed by the old 'Brig o'Balgownie,' of one Gothic arch. Lord Byron, while a youth, had a superstitious dread in crossing this bridge, from an old prophecy connected with it. To keep this bridge in repair, Sir Alexander Hay, 1605, left an annuity of £2, 5s. 8⅔*d.*, which sum has now accumulated to about £25,000, in addition to about £17,000 spent in 1825, in the erection of a new bridge over the Don, a quarter of a mile lower down.

DONALDSON, *dŏn'ald-son*, James Lowry: 1814, Mar. 17—1885, Nov. 4; b. Baltimore: soldier. He graduated at the U. S. Milit. Acad. 1836; served through the Seminole war in Fla. as 2d lieut. 3d artil.; was assigned to 1st artil. 1837; and promoted 1st lieut. 1838. After a period of garrison service, he was ordered to Fort Brown, Tex., 1846, thence to Mexico, where he won brevets of capt. and maj. for gallantry at Monterey and Buena Vista, and was appointed assist. quartermaster and promoted to be full capt. 1847, Mar. He was chief quartermaster of the dept. of N. Mex., 1858–62, of the milit. div. of the Tennessee, 1865, and thence of the milit. div. of the Missouri till 1869; became col. on the regular staff and brev.-maj.-gen. of vols.; was retired 1869; and resigned from the army 1874, Jan. 1. He is credited with having suggested the creation of national soldiers' cemeteries and the annual ceremony of decoration.

DONALDSON, *dŏn'ald-son*, John William: 1811, June 10—1861, Feb. 10; b. London; descendant of an old Scotch family. He was educated first at the Univ. of London, afterward at Trinity College, Cambridge. He graduated B.A. 1834, and the year following, he was elected Fellow. His first work was *The Theatre of the Greeks*, partly original and partly compiled, which, revised in six successive editions,still holds its place as a school and college class-book. He was assistant-tutor of Trinity, Cambridge, when he published the first edition of his *New Cratylus* (1839), remarkable for its research and boldness, and as the first attempt, on a large scale, to familiarize Englishmen with the principles of comparative philology, as established by the great scholars of Germany—with special application to the Greek language. The *New Cratylus*, in its latest

largest, and most improved form, is still the most important work in English on the subject.

DON'ALDSON'S HOS'PITAL: extensive establishment at Edinburgh, of the character of Christ's Hospital, London. Its founder was James Donaldson, printer in Edinburgh, son of Alexander Donaldson, publisher (see BOOK-TRADE: COPYRIGHT). In 1763, Alexander started the *Edinburgh Advertiser* newspaper, afterward conducted by his son James. Dying in 1830, James bequeathed the estate of two generations, amounting to about £215,000, to trustees, for the endowment and erection of a hospital for the maintenance and education of poor boys and girls. The building, which occupies a commanding situation w. of Edinburgh, was begun 1842, and finished 1850: it is a large and beautiful quadrangular structure, in the Elizabethan style. The cost of the edifice and furnishings was nearly £124,000, but as this was defrayed by the accumulated interest, the original endowment remained untouched.

DONATELLO, *do-nâ-tĕl'o* (properly, DONATO DI BETTO BARDI): one of the restorers of the art of sculpture in Italy: 1383–1466, Dec. 13; b. Florence. He belonged to the Donato family, which reckons several scholars among its members, and gave some doges to the republic of Venice. *Donatello* was a diminutive given to the artist in childhood. He received his earliest instructions from Lorenzo Bicci. His first great works in marble were the *St. Peter* and *St. Mark* in the church of St. Michael in his native city. His own favorite, however, was the statue of an old man in the garb of a senator, on the steeple of the same church. It is known under the name of *Zuccone* (the Gourd or Baldhead). Donatello died at Florence. Donatello's principal works, besides those mentioned, are—a statue of *St. George* (in marble), *Judith bearing the Head of Holofernes* (in bronze), the *Crucifixion* (in wood), several statues of the *Baptist* (in various materials), and a grand equestrian statue (in bronze) of Erasmus Gattemelata, on one of the public places of Padua. He also executed a number of bas-reliefs. The whole tendency of Donatello's genius was toward a reproduction of the antique; and his style, though not free from harshness and the rudeness of early art, sometimes reminds one of the glorious productions of ancient Greece.

DONATI, *do-nâ'tē*, GIOVANNI BATTISTA: 1826, Dec. 16 – 1873, Sept. 20; b. Pisa, Italy: astronomer. He was appointed assist. in the observatory of Florence 1852, and succeeded Prof. Arni as director 1864, and became prof. of astronomy in the Royal Institution of Florence. The royal observatory on the hill of Arcetri, near Florence, memorable as the site of Galileo's tower, was erected under his superintendence, and directed by him. He made discovery of comets 1855, June 3, 1857, Nov. 10, 1858, June 2, and 1864, Sept. 9, and numerous spectroscopic observations of comets and the solar disk, and published diagrams

of several lines in the spectra of 15 stars 1862. His chief distinction lies in the discovery of the splendid 1858 comet, which now bears his name. It was visible many months, and came nearest to the earth in Oct., when its tail was remarkably brilliant and estimated to be over 40° in length. A combination of all the observations that were made on its position, assigned it to a period of about 1,950 years.

DONATION, n. *dō-nā'shŭn* [F. *donation*—from L. *donātiōnem*, a donation—from *dōnō*, I give; *donātus*, given]: the act of giving; a grant or gift; that which is given or bestowed. DONATIVE, a. *dŏn'ă-tĭv*, vested or vesting by donation: N. a gift; a gratuity; in *Eng. law*, a benefice merely given by the patron to a clergyman without presentation, institution, or induction. DONEE, n. *dō-nē'*, the person to whom a gift is made. DONOR, n. *dō'nĕr* [F. *donneur*]: one who gives a gift; a benefactor. DONATION PARTY, n. a party assembling at the house of a person, as of the parish clergyman, each bringing a present.—SYN. of 'donation': benefaction; grant; gift; present.

DONA'TION, in Law: grant or gratuity, a transfer of property without any transfer in requital. A donation in prospect of death, *donatio mortis causa*, differs from a gift *inter vivos*, inasmuch as it is incomplete, and revocable during the donor's life, or ambulatory, as lawyers say. It differs from a legacy, on the other hand, in that it requires no probate, for it is not a testamentary act, the donee's title proceeding directly from the donor in his lifetime. In Roman (followed by Scottish) law there was distinction between donations *pure*—or those not in anticipation of death, marriage, or any other specific event—and gifts. Such donations are in reality gifts, but gifts not intended to be immediately delivered. It was with reference to this species of donation that the equitable arrangement called the *beneficium competentiæ* was introduced, by which the donor was allowed to retain as much as was necessary for his own subsistence before fulfilling the obligation, if he was reduced to indigence. Another implied condition of a donation by the Roman law was, that when any one who had no children made a donation of the whole or the greater part of his estate, the donation became void if he had children afterward; the presumption being, that he would not have given his property away if he had anticipated that he was to become the father of a family. It is a general principle of law, that a donation is never presumed; but this rule suffers an exception in the case of aliment given without an agreement to pay board, which is presumed to be gratuitous unless given by one who makes a livelihood of entertaining strangers. Minors, and persons incapable of contracting, are not presumed to have been alimented gratuitously, unless their relationship to their entertainer be such as to warrant the presumption. Where the minor is possessed of an adequate separate estate, even the father may claim the expense of maintaining him, and the rule applies with greater force to all more distant relatives. Donations between man and wife (*inter virum et uxorem*)

were by the Roman law, and are by the law of Scotland, revocable by the donor at any time during his or her life, *ne conjuges mutuo amore se spolient* (lest the spouses should despoil themselves from mutual love). But mutual grants for substantial considerations between the spouses are not revocable, if there be any reasonable proportion between the two. Thus, where there has been no ante-nuptial contract of marriage, the husband may provide for the wife in the event of her survivance, and the provision will be effectual so far as it is rational. It will be revocable only *quoad excessum*. Donations in the prospect of marriage (*donationes propter nuptias*) in the Roman law were given by the husband in security of the dowry or *dos*, which he was bound to pay back to the wife or her relatives on the dissolution of the marriage. When the *dos* was returned to the wife, the donation was returned to the husband.

In the United States, a donation in expectation of the giver's death must be something more than an evidence of intention to give, such as a check drawn but not transferred. Donations of personal property between husband and wife, not made for defrauding creditors, are valid, and donations of real estate may be held good in equity, though usually not at law; the intervention of a third person will give validity. Gifts of property before an intended marriage, by the prospective husband to the prospective wife, are valid even as against creditors, but will be subjected to strict scrutiny for evidence of good faith. Indeed, generally in a donation the evidence of good faith must be clear.

DONATIST, n. *dō'nă-tĭst* [from *Donātus*, their leader]: follower of Donatus, a Numidian bishop who opposed the election of Cecilianus in 311 to the bishopric of Carthage, on the ground of the ordination having been performed by one who had been a Traditor, or traitor—that is, one who during persecution, had given up the sacred books to the pagan authorities; and also because Cecilianus had exhibited great hostility toward the victims of the late persecution. There were indeed two Donatuses connected with this sect, Donatus, Bp. of Casæ Nigræ, and Donatus surnamed Magnus, who succeeded Majorinus as Bp. of Carthage, 315,—the latter the most influential leader. After some time, the Council of Arles, 314, Aug. 1, decided against Donatus, who in a short time seceded from the Catholic Church, and formed a distinct sect, which, by 330, had 172 bishops in n. Africa. The Donatists, like the followers of Novatian (q.v.), went upon the principle, that the essence of the true church consisted in the purity and holiness of all its members individually, as well as in its apostolical and Catholic foundation and doctrine. They therefore both excommunicated all lapsed and gross offenders, not receiving them again but on being re-baptized, and also held that the efficacy of the sacraments depended on the worthiness of the administrator. Driven to fanaticism by the oppression of the secular power, they not only denied to the state

all right to meddle with ecclesiastical affairs, but bands of Donatist ascetics collected, attacked the imperial troops (348), and continued to devastate Mauritania and Numidia for a dozen years. In the beginning of the 5th c., they seem to have almost equalled the Catholics in number, and the eloquence of Augustine and the severities of Honorius were exercised upon the sect in vain; they continued to exist as a separate body. But by adopting a more prudent plan of proceeding, the Catholic bishops had, by the end of the 6th c., induced most of those that had left to return to the bosom of the church; and in the 7th c. the Donatists were extinct. *Donatism*, the system of this sect, regarded by Neander (see *Dogmengsechichte*, translated into English by J. E. Ryland: Bohn, II. 394) as a reaction against that form Catholicism, 'which conceived the church to be an outward organism, continued by the succession of bishops, who formed the necessary medium of communication with Christ, and for partaking in the Holy Spirit and salvation.' 'Whoever is shown to be a Christian in a right and lawful manner, is to me a Catholic,' was a saying of the Donatists; while the church in general, guided by Augustine, wished to let the worthy and unworthy remain mixed together, and to defer the separation to the final judgment.' The Donatists have been called the Puritans of their day, but this comparison is somewhat forced. Their ideal of the church was certainly higher than that of their opponents, and may be deemed more scriptural; though both its scripturalness and its practical character are stoutly denied in great sections of the church. That the Donatists were mostly fanatical in the extremes to which they pressed the application of their principles, is undeniable. Their revolt introduced great social excesses.

DONATUS, *dō-nā′tŭs*, ÆLIUS: well-known grammarian and commentator, who taught grammar and rhetoric at Rome about 355, and was the instructor of St. Jerome. He wrote treatises, *De Literis, Syllabis, Pedibus et Tonis, De Octo Partibus Orationis*, and *De Barbarismo, Sōlecismo*, etc., the best edition of which is in Lindemann's *Corpus Grammaticorum Latinorum* (vol. i.). These writings form a full course of Latin grammar, and in the middle ages were the only text-book in the schools, so that Donat came, in the west of Europe, to be synonymous with grammar, or with the elements of any science. *The Donat into Religion* is the title of a book by an English bishop, and there was an old French proverb, *Les diables estoient encore à leur Donat* (The devils were yet in their grammar). The Latin grammar of Donatus has formed the groundwork of the elementary treatises on that subject to the present day. Donatus was one of the first books on which the art of printing by means of letters cut on wooden blocks was tried, and copies of these Donatuses are reckoned among the greatest bibliographical curiosities. The author also wrote a commentary on Terence, of which we possess only a part extending to five comedies, printed in the ed. of Terence by Kloz (2 vols., Leip. 1838).

From this Donatus must be distinguished a later grammarian, TIBERIUS CLAUDIUS DONATUS, from whom we have a worthless life of Virgil, prefixed to many editions of that poet, and fragments of a commentary on the *Æneid*.

DONAUWÖRTH, *dō'now-vört:* town of Bavaria, at the confluence of the Wernitz and the Danube, about 25 m. n.n.w. of Augsburg. It is well built in the form of an amphitheatre, round the side of a hill, and is surrounded by walls. It was formerly a free imperial city of considerable importance, but has now sunk into insignificance. It is historically interesting as the main cause of the Thirty Years' War; the severity of the punishment meted out to the inhabitants in 1607, in consequence of their adoption of the Reformed doctrines, and their assault on a Rom. Cath. procession of the 'host,' having led to the formation of the Prot. League, and Cath. Union, the opponents in that long and severe struggle. It is likewise associated with the name of Marlborough, who stormed and carried the intrenched camp of the Bavarians here 1704. Also, 1805, Oct. 6, the French, under Soult, obtained a victory here over the Austrians, under Mack. Pop. abt. 4,000.

DONAX, *dō'naks:* genus of lamellibranchiate mollusks, of the family *Tellinidæ*, with shell of two equal valves, which close perfectly, and are of triangular form, prettily striated from the beak to the margin, the beak occupying the obtuse angle of the triangle. The species of Donax are generally small. The fossil species are not numerous, and belong to the eocene formation.

DONAX: see REED.

DON BEENITO, *dŏn bā-nē'tō:* town of Spain, province of Badajoz, 55 m. e. of the city of Badajoz. It is near the left bank of the Guadiana, and is in general well built, with wide and clean streets. It has several squares, the chief of which is lined with the principal structures in the town, including the town-hall, prison, and a convent; and in the centre is a public promenade. Don Benito has manufactures of woolens, wine, and oil, and its proximity to the Guadiana affords it great trading facilities. Pop. abt. 16,000.

DON CAR'LOS: see CARLOS.

DONCASTER, *dŏng'kas-tẽr:* municipal borough in the W. Riding of Yorkshire, England, on the right bank of the Don, on the Great North Road, 35 m s. of York. The country around is flat, but beautiful. Fine old elms line the broad and level road from the south. Doncaster is very clean, and well built. Its High street is a mile long. It has manufactures of iron, brass, sacking, linen, and agricultural machines. Its corn-market is large and important. Doncaster was the ancient *Danum*, and lay on the Roman road from York to Lincoln. Roman coins, urns, and a votive altar have been found here. It was the *Dona Castre* of the Saxons. The Saxon Northumbrian kings had a palace here. Doncaster was burned by lightning 759, and frequently ravaged by the Danes. It

has long been famous for its annual races, begun 1703, and held a mile s.e. of the town in the second week of September. Colonel St. Leger, 1776, founded stakes which have been yearly run for by the best horses in England. On an eminence five m. w.s.e. of Doncaster are the ruins of Conisborough Castle, a Norman-Saxon round tower, 37 ft. in diameter and 86 ft. high, with walls 15 ft. thick, strengthened by square buttresses reaching the whole height. The door is arrived at by an external flight of 37 steps, and within is a cylinder open to the sky. Pop. (1901), 28,032.

DON COSSACK, *dŏn kŏs'sak:* govt. of Russia, bounded n. by the govt. of Saratov, s. by the Caucasus and Chernomarsk, e. by Astrakhan, w. by Voronezh and Yekaterinoslav; bet. lat. 46° 10′ and 51° 10′ n., long. 37° 10′ and 44° 15′ e.; 63,532 sq. m.; cap. Tagaurog. It consists of a vast plain, forms a part of the basin of the Don river, which traverses it, has a mild and pleasant climate in summer with great cold and severe storms in winter, possesses a soil of considerable fertility though poorly cultivated, and has extensive agricultural and cattle-raising interests. The people resemble Russians, but are not as stout in build, are spirited, brave, and great horsemen; their language combines the Russian, Polish, and Turkish; and their religion is that of the Greek Church. They live entirely by military rule, and their original tribal character has almost wholly disappeared under Russian sovereignty. Pop. 2,575,818.

DONDRA HEAD, *dŏn'drâ hĕd:* most southerly extremity of Ceylon, lat. 5° 55′ n., long. 80° 38′ e. As compared with Cape Comorin, the corresponding point in the peninsula of Hindustan, it more directly faces the Indian Ocean, and lies nearer the grand thoroughfares of eastern commerce. An adjacent village of the same name has 900 inhabitants.

DONE, *dŭn* [pp. of Do, which see]: performed; finished; agreed. Done brown: see under Brown.

DONEE: see under Donation.

DONEGAL, *dŏn-ē-gawl':* maritime county in Ulster province, Ireland, washed by the Atlantic on the n. and w.; greatest length, 85 m.; greatest breadth, 41; average, 27; 1,870 sq. m., one-third being arable, and one-one-hundred-and-sixtieth in wood. The coast-line is 395 m. long, indented by deep bays and loughs, 2 to 20 m. broad, and 15 to 25 long. Some of the coast cliffs rise from 500 to 800 ft. Of the many isles of the coast, 17 are inhabited. Except a small tract in the e. and s.e., the surface is mountainous, moory, and boggy, with many small lakes and rivers, associated with endless fairy tales and traditions. The highest hill, Erigal, rises 2,462 ft., and several other hills exceed 2,000 ft. The mountain-ridges run n.e. and s. w. The largest stream is the Foyle, running 16 m. n.e. into Lough Foyle. Derg is the largest loch. The geological structure of Donegal consists of granite, metamorphic

rocks, and graywacke, with Devonian and carboniferous limestone strata and trap. White marble occurs at Dunlewy. Except on the Foyle, the climate is moist, raw, and boisterous from violent w. and n.w. winds. There are many ruins of houses and churches overwhelmed with sand. Of the Irish counties, Donegal, in ratio to its area, has least land in cultivation and occupied by towns and woods. The soil is generally cold and poor on the primitive rocks, and light clay on the slaty. In 1890, there were in crop 165,536 acres, the largest proportion being oats, potatoes, turnips, and flax. There are manufactures of linen, worsted stockings, worked muslins, and kelp, and fisheries of cod, sole, plaice, herring, and mackerel. Trade is chiefly through Londonderry. Inaccessible retreats and abundance of turf-fuel made Donegal at one time the chief seat of illicit distillation in Ireland. It contains 6 baronies, 8 poor-law unions, and 51 parishes. Donegal sends four members to parliament. The towns are small, the chief being Lifford, the county town; Ballyshannon, Letterkenny, Rathmelton, Donegal, and Killybegs. Industrious farmers and artisans occupy the low fertile tracts. The population of the mountain districts has been much diminished by emigration Till 1612, when James I. planted Ulster with English and Scotch settlers, the s. part of Donegal was called Tyrconnel, and belonged to the O'Donnels, who, from the 12th c., were inaugurated as Princes of Tyrconnel on Doune Rock, near Kilmacrenan. Donegal has many ruins and trades of forts, of 30 religious houses, castles, and of the palace of the North Irish kings on a hill near Lough Swilly. Near Derry is the coronation-stone of the ancient Irish kings. Donegal contains many memorials of St. Columba. Warren, 1798, captured a French fleet off Tory Isle. This isle contains the remains of seven churches, two stone crosses, and a round tower. St. Patrick's Purgatory is on an isle in Loch Derg. Pop. 173,722.

DONELSON, *dŏn'el-sŭn*, Andrew Jackson: politician: 1800, Aug. 25—1871, June 26; b. near Nashville, Tenn. He graduated 1820 at the U. S. milit. acad. and for two years was aide to his uncle, Gen. Andrew Jackson, gov. of the terr. of Fla. He resigned 1822, studied law and was admitted to the bar. When Jackson was elected pres., Donelson became his confidential adviser and private sec., so acting to the close of his second administration. He was appointed 1844 *chargé d'affaires* to the republic of Tex.; 1846 minister to Prussia; 1848 minister to the German federal govt., resigning 1849. Quitting the Democratic party 1853 he joined the American party, and was nominated and defeated for vice-pres. 1856. He then retired from political life to his extensive estates. He published *Reports of Explorations* (1855).

DONELSON, Fort, *dŏn'ĕl-sŭn:* Confederate fortification on the left bank of the Cumberland river in n.w. Tenn.; 12 m. from Fort Henry on the right bank of theTennessee river and connected with it by road—both forts being 40

m. above the junctions of these rivers with the Ohio. They commanded the navigation of the Cumberland and Tennessee rivers, and were of great importance to the Confederates operating in the region between Memphis and Bowling Green in the winter of 1861–2. In 1862, Jan. a combined attack upon these works was planned for the Union army and navy. On Feb. 2, a fleet of 7 vessels under command of Com. Andrew H. Foote, left Cairo, Ill., and was followed by an army of 15,000 men under command of Gen. Grant in transports. On the 6th, without waiting for Gen. Grant, who was detained by bad roads, Com. Foote opened fire on Fort Henry, defended by 17 guns and 3,000 men under command of Gen. Tilghman, and forced its surrender in a little over an hour, but owing to the delay of the army all the garrison except Gen. Tilghman and about 70 men escaped to Fort Donelson. Gen. Grant began the land movement against Fort Donelson Feb. 12, the advance of his army reached the land front that night, invested the lines, and made an unsuccessful attack and assault the following day. The fleet arrived on the 14th. Meantime the garrison had been strengthened by that from Fort Henry and by the commands of Gens. Pillow, Buckner, and Floyd, the whole aggregating 20,000 men. The fleet opened fire a few hours after arrival, but in less than 2 hours every vessel was disabled and had to withdraw. On the 15th the Confederates made a sudden sally upon the investing lines, but after an engagement lasting from 5 A.M. till 5 P.M. were repulsed and forced within their works by a general Union advance. The loss on each side in killed, wounded, and prisoners was about 2,000. While Gen. Grant was arranging for a general assault the following morning, the Confederate generals held a council of war, agreed to the necessity of surrender, and then Gens. Floyd and Pillow with nearly 2,000 men escaped under cover of the darkness, leaving the command and formal act of surrender to Gen. Buckner. Seeing the futility of any resistance, Gen. Buckner surprised Gen. Grant early in the morning by dispatching a flag of truce with an inquiry as to terms of capitulation, to which the Union commander made the memorable reply: 'No terms other than unconditional surrender can be accepted. I propose to move immediately upon your works.' The surrender followed at once, by which 14,625 prisoners, 65 cannon, 17,600 small arms, and large quantities of stores and ammunition fell into Gen. Grant's hands. Gens. Floyd and Pillow were censured and suspended from their commands for their conduct. Gen. Buckner acted as a pall bearer at the funeral of Gen. Grant 1885, and was elected gov. of Ky. 1887.

DONETZ, *dō-nĕts'*: river of s. Russia; chief affluent of the Don: rises in the govt. of Koorsk, and after a s.e. course of 400 m. through the govts. of Kharkov and Don Cossacks, joins the Don on the right 40 m. n.e. of Novo-Cherkask; has fertile banks and a deep channel; receives the waters of the Oskol, Aidar, and Kalitva from the n.;

is navigable as far up as Smiev; and has the towns of Biel-gorod, Smiev, Izioom, and Slavianoserbsk on its banks.

DONGAN, *dŏn'gan*, THOMAS, Earl of Limerick: 1634—1715, Dec. 14; b. Castletown, co. Kildare, Ireland: colonial gov. of N. Y. After serving in the British and French armies and attaining the rank of col., he was appointed lieut.-gov. of Tangiers by Charles II., and colonial gov. of N. Y. by the Duke of York 1682. He gave the city of New York its first charter 1686, and, being accused of ignoring his pacific instructions regarding the French and Indians and of inciting the Five Nations to war, resigned his commission 1688, returned to England 1691, and inherited the earldom of Limerick 1698. He died in London.

DONGARPUR, *dŏn-gâr pŭr':* fortified town of Rajputana, Central India; lat. 23° 50′ n., long. 73° 45′ e.; 345 m. n. of Bombay. It is cap. of the protected state of DONGARPUR, which contains 1,440 sq. m., and 175,000 inhab.

DONG-NAI, *dŏng-nī':* river in Anam or Cochin-China, an oriental state which has recently derived an adventitious interest from the combined incursions of France and Spain. The river enters the Chinese Sea, by various mouths, about lat. 10° 20′ n., and long. 107° e. It is navigable for large vessels as far up as Sai-gon, which, with pop. 180,000, and trade of great value stands 40 m. from the coast. From this city, a canal of 23 m. connects the Dong-nai with the Menamkong, or Cambodia, which, in a more westerly channel, divides Anam from Siam.

DONG-NAI: town on an affluent of the river Dong-nai, in Anam; 25 m. n.e. of Sai-gon.

DONGOLA: the name of a province of Egyptian Soudan, Central Africa; and also the cap. of the same, on the Nile, lat. 19° 10′ n., long. 30° 22′ e. After the revolt of El Maldia (1882–5), one part of the province was occupied by the British and the other by the Italians. The latter on being defeated at Adowa, Abyssinia, 1896, Mar. 1, temporarily evacuated Kassala, an important strategic town. On perceiving this move the Dervishes sought to occupy the place, but they were twice repulsed by the Italians on April 2, when it was estimated that there were 15,000 Dervishes in the vicinity. This activity by the latter led to an Anglo-Egyptian expedition under Gen. Kitchener, Sirdar of the Egyptian Army, and by 1896, Sept. 30, the province had fallen into his hands.

DO'NIS CONDITIONAL'IBUS, STATUTE DE, called also the Statute of Westminster the Second 13 Edw. I. c. 1: statute which established in England the power of creating an Entail (q.v.). Before the passing of this act, it had been held by the judges that a conveyance to a man and the heirs of his body was a fee-simple conditional, i.e., a Fee-simple (q.v.) on condition that the donee should have heirs of his body; and this condition having been purified by the birth of an heir, the donee was at liberty to alienate or burden the land, and thus to defeat the original gift.

In this respect, however, the gift differed from a fee-simple, that if the donee failed to exercise his power of alienation, and died without issue surviving, the land descended not to the heirs of the donee, but to those of the donor. To counteract the decision of the judges above noticed, the statute *de donis* was passed. It provided 'that the will of the giver, according to the form in the deed of gift manifestly expressed, shall be from henceforth observed.' From the date of this act, the courts recognized two estates in the land—viz., that of the donee, which is called a Fee-tail (q.v.), and that in the donor, which was a reversion or expectancy, by which, on the termination of the estate-tail, the lands would revert to the original owner. As to the manner in which even this intention was defeated, see ENTAIL. Not only lands, but rents, dignities, etc., might be entailed under this act.

DONIZETTI, *do-nē-dzĕt'tē*, GAETANO: 1798-1848; b. Bergamo, Lombardy; famous Italian composer. He learned the elements of music at the Lyceum of that town, and later, the art of composing under Simon Mayr. Donizetti's first compositions were of church-music, but the only success that he obtained by them was an appointment as a chorister at the church of Basilica di San-Maggiore. Donizetti gave up that position very soon, and after several vicissitudes, entered the military service of Austria. Donizetti then applied himself to the composing of operas, of which he has left more than 60. *Enrico di Borgogna*, 1819, with 19 others that followed, failed to produce any marked result; and it was not until 1831 that his renown began to spread beyond Italy. *Anna Bolena*, *L'Elisir d'Amore*, *Lucrezia Borgia*, *Marino Faliero*, *Lucia di Lammermoor*, *La Fille du Régiment*, followed each other in rapid succession, adding new lustre to his fame. Donizetti's last productions were *Don Sebastiano* and *Caterino Cornaro*. He died at Bergamo. Among modern Italian composers, Donizetti is reckoned nearest to Rossini, whose style he imitated during the first stage of his career. Donizetti's music is praised not so much for melody as for dramatic truth and solidity of execution.

DONJON, n. *dŏn'jŏn* [F. a turret, a tower—either from *dun*, an elevation natural or artificial on which it was placed, or from mid. L. *domnĭōnem*, a tower which dominates—from L. *domĭnum*, a lordship (see DUNGEON)], principal tower or keep (q.v.) of a castle (q.v.) or fortress. From the circumstance that the lower or underground story of the donjon was used as a prison, has come the modern meaning of the word Dungeon. See CASTLE.

DON JUAN, *dŏn jū'an:* a legendary and mythical personage like Dr. Faustus. The two have been made the representatives of two different tendencies, both proceeding from the same principle—from the principle, namely, of unbelief and godlessness, which necessarily turns self into either a god or a beast—the principle of subjectivism, or selfishness become dominant. In Faust, expression is

been given to the subjective idealism of the Germanic nations, their tendency to subtle speculation and a rationalism antagonistic to faith. In Don Juan appear the practical materialism and refined sensualism of the Romanic peoples, and the tendency of blind belief in a corrupt catholicism to pass into unbelief.

Although Faust and Don Juan have thus the same source and the same termination, yet as they proceed from opposite poles, they stand in contrast to each other, and, as was natural, have found different vehicles of expression—Faust in poetry, Don Juan in music. The ideal of the Don Juan legend is presented in the life of a profligate who gives himself up so entirely to the gratification of sense, especially to the most powerful of all the impulses, that of love, that he acknowledges no higher consideration, and proceeds to murder the man that stands between him and his wish, fancying that in so doing he had annihilated his very existence. Partly in wanton daring, partly to allay all uneasy misgiving, he then challenges that Spirit in which he disbelieves to demonstrate to him its existence in the only way he holds valid—namely, through the senses. When this actually happens, when the Spirit proves its existence and power by animating the marble statue which he had, with daring mockery, invited as his guest, and summoning him to the final tribunal, compels him to acknowledge the supremacy of spirit, and the worthlessness of a merely sensuous, godless, and immoral existence, it is all over with him, he is crushed, and sinks into hell.

This ideal career is aptly localized in one of the most luxurious cities of the once world-monarchy of the Saracens—viz., Seville—and the characters wear the names of the ancient noble families of the place. The hero of the story, Don Juan, is described as a member of the celebrated family Tenorio, and is represented as living sometimes contemporary with Peter the Cruel, sometimes with Charles V. The chief aim of his sinful career is the seduction of the daughter of a governor of Seville, or of a nobleman of the family of the Ulloas. Being opposed by the father, he stabs him in a duel. He then forces his way into the family tomb of the murdered man, within the convent of San Francisco, causes a feast to be prepared there and invites the statue which had been erected to his victim to be his guest. The stone guest appears at table as invited, compels Don Juan to follow him, and, the measure of his sins being full, delivers him over to hell. At a later period, the legend came to be mixed up with the story of a similar profligate, Juan de Marana, who had in like manner sold himself to the devil, but was at last converted, and died as a penitent monk in the odor of sanctity.

The genuine legend of Don Juan was put into form first by Gabriel Tellez (Tirso de Molina), in *El Burlador de Sevilla y Convivado de Piedra*. This drama was transplanted to the Italian stage about 620, and soon found its way to Paris, where numerous versions of it, among

others Molière's *Festin de Pierre* (1669), made their appearance. It was brought on the English stage by Shadwell under the title of *The Libertine* (1676). In the end of the 17th c., a new Spanish version of Tellez's play was prepared by Antonio de Zamora, and brought on the stage. It is this version that forms the groundwork of the latter Italian versions and of Mozart's opera. It was first put into an operatic form by Vincenzo Righini in *Il Convitato di Pietra* (1777); the text of Mozart's *Don Giovanni* was written by Lorenza da Ponte (1777). Through this famous opera the story became popular all over Europe, and has since furnished a theme for numbers of poets, playrights, and writers of romance. A. Dumas has a drama, *Don Juan de Maranna;* Byron's *Don Juan* follows the name, and so far the character, of the original; and Prosper Merimée's novel, *Les Ames du Purgatroie, ou les Deux Don Juan,* is founded upon it.

DONKEY, n. *dŏng'kĭ* [comp. Gael. *dona-eachan,* an inferior little horse—from *dona,* bad; *eachan,* a little horse; perhaps *dun,* an old familiar name for a horse from the prevailing color, and *key* for *kin,* a diminutive termination]: an ass; a well-known domestic animal; [Ger. *dummkopf,* thick head, a blockhead]: a stupid person. DONKEY-ENGINE, in a *steam-ship,* a small engine used for pumping water into boilers, raising weights, etc.

DONNA: see under DON, n.

DONNE, *dŏn,* JOHN, D.D.: 1573-1631; b. London: son of eminent merchant, cadet of an ancient family in Wales. His parents were Rom. Catholics, and he was educated in that faith. At the age of 11 he went to Oxford, where he remained three years; thereafter, he removed to Cambridge. Although he greatly distinguished himself at these seats of learning, the faith of his parents prevented his taking a degree. At the age of 17, he entered Lincoln's Inn, to read for the bar; and while so engaged, he carefully studied the principal points in dispute between Rom. Catholics and Protestants, and finally joined the latter. About this time, he wrote several of his minor poems, the erotic heat of which contrasted strangely with the austerity of his later years. In 1594, he went abroad, and lived three years in Spain and Italy. On his return, he was made sec. to Lord Ellesmere, then lord keeper of the great seal. Here he fell in love with that nobleman's niece, and they were privately married. When the union was discovered, Donne was imprisoned by the enraged nobleman. After his liberation, he recovered his wife by legal process, and, without settled employment, went to reside at the house of Sir Francis Wooley, kinsman of his wife. After the death of Sir Francis, he removed to London, and lived with Sir Robert Drury, in Drury Lane. With Sir Robert he went to Paris; and on his return, at the instigation of James I., who was delighted with the *Pseudo-Martyr,* a book which Donne had written against the Rom. Catholics, he entered holy orders. He was made

D.D. by the Univ. of Cambridge; and after accompanying an embassy to the queen of Bohemia, he was made on his return Dean of St. Paul's, and vicar of St. Dunstan's. He died of a fever. His life has been written by Izaak Walton —forming one of the group of 'lives' so praised by Wordsworth in a celebrated sonnet.

Donne's works consist of satires, elegies, religious poems, complimentary verses, and epigrams; they were collected and published by his son 1650. An earlier but imperfect collection appeared 1633. Donne is usually considered the first of a series of poets of the 17th c., who, under the infelicitous name of the Metaphysical Poets, fill a conspicuous place in English literary history.

DONNELLY, IGNATIUS: an American author; 1831, Nov. 3—1901, Jan. 1; b. in Phila., Pa.; was admitted to the bar in 1852; removed to Minn. in 1856; gov. of the state in 1859; and a member of Congress 1863–9. Among his writings are an *Essay on the Sonnets of Shakespeare; Atlantis, the Antediluvian World; The Great Cryptogram; Ragnarok; Caesar's Column; A Story of the Twentieth Century; The Golden Bottle*, a political novel; *Doctor Huguet; The American People's Money;* etc. He also wrote the preamble to the Omaha platform of the People's party.

DONNYBROOK, *dŏn'ĭ-brûk*, or ST. MARY'S OF DONNYBROOK: parish and village of co. Dublin, now part of Pembroke, a suburb of Dublin, Ireland; famous for its annual 15-days' fair, beginning Aug. 26, granted by King John for the sale of horses and cattle, subsequently reduced to one week and restricted to pleasure, and abolished on account of the tumults, broils, and various excesses of its participants, 1855. The Dodder river is here crossed by a handsome bridge, and the village contains a beautiful church, magdalen asylum, lunatic asylum, several high grade schools, a dispensary, hospital for incurables, and a number of mills. Pop. abt. 2,000.

DONOR: see under DONATION.

DON QUIX'OTE: see CERVANTES.

DONZEL, n. *dŏn'zĕl* [It. *donzello;* Sp. *doncel;* OF. *donzel* —from L. *doncellus, dominicellus,* dim. of L. *dominus,* a lord, a master]: a young gentleman following arms but not yet knighted; a young squire or attendant; a page.

DOO, *dô*, GEORGE THOMAS: one of the best English historical engravers: 1800, Jan. 6—1886, Nov. 13: b. in the parish of Christ Church, Surrey, England. He is known best by his famous plate of *Knox Preaching before the Lords of the Covenant*, after Wilkie; while his admirable rendering of Eastlake's *Italian Pilgrims Coming in Sight of Rome*, his exquisitely finished heads of women and children, after Lawrence, his engravings from Raffaelle, Correggio, and others, have won for him a very high esteem. In 1851, he was elected a fellow of the Royal Soc., and, 1856, a Royal Academician. He was appointed chairman of the engravings committee of the London

International Exhibition of 1862. In 1864, he completed, after eight years' work, a large engraving of the *Raising of Lazarus* by Sebastian del Piombo.

DOOB-GRASS, or DOUB GRASS, n. *dôb-grăs* [Hind. *dub*]: *Cynodon dactylon*, a perennial creeping grass, prized in Hindustan as excellent food for cattle. It was brought into the United States from Europe.

DOOBOOKA: see DUBOOKA.

DOODLE, n. *dô'dl* [Scot. *dawdle*, to be indolent or slovenly]: a trifler; a simpleton.

DOODLE-SACK, n. *dô'dl-săk* [Ger. *dudelsack*]: the bag-pipe.

DOOLY, or DOOLEE, n. *dô'lĭ* [Skr. *dola*, a swing litter]: in the *E. Indies*, a litter suspended from men's shoulders for carrying persons; a palanquin.

DOOK, or DOUK, n. *dôk* [etym. doubtful]: a wooden plug or block inserted in a brick or stone wall for the subsequent attachment of the finishing pieces; the act of dipping, ducking, or bathing; a bath; in *swim.*, the same as dip-working (q.v.).

DOOM, v. *dôm* [AS. *dom*, judgment; *deman*, to judge: Icel. *domr;* Goth. *doms*, judgment: Lith. *dum-á*, mind, thought: Gr. *thumos*, breath, life]: to sentence; to condemn; to destine: N. judgment; fate; destiny; ruin; destruction. DOOM was the old name given to the last judgment, and to those representations of it in churches which have a religious rather than an artistic object. Many of the dooms are executed in distemper. In the reign of Edward VI. most of them were washed over, or otherwise obliterated, as superstitious. A fine one remains in the church of the Holy Trinity at Coventry, England. DOOM'-ING, imp. DOOMED, pp. *dômd*. DOOM-BOOK: see DOM-BOC.—DOOMSDAY, n. *dômz-dā*, the day of judgment; the last great day. DOOM'FUL, a. *-fûl*, full of destruction. DOOM'STER, n. *-stẽr*, in *Scot.*, the hangman; one who pronounces the *doom* or sentence: see DEEMSTER (under DEEM).—SYN. of 'doom, n.': sentence; condemnation; destiny; decree; fate; lot; penalty; retribution; judgment.

DOOM (or DUM) PALM (*Hyphæne Thebaica*): species of palm remarkable for repeated forkings of its stem. It is a native of Upper Egypt and of central Africa. In some districts it is the most plentiful tree, sometimes even forming forests, sometimes growing amid the very sands of the desert. Its leaves are fan-shaped. Ropes are made of the fibre of its leaf stalks. Its fruit is about the size of an orange, but of somewhat elongated irregular shape; the outer skin is red, and this being peeled off, a considerable thickness of a spongy dry substance is found within it—also part of the *pericarp*—which has an insipid sweetness, and a remarkable resemblance to gingerbread, so that the tree is sometimes called the GINGERBREAD-TREE. This substance is used as an article of food, and an infusion of it as a beverage. The infusion is cooling, gently aperient,

and very salutary in fevers. The albumen of the seed is hard and semi-transparent, and is turned into beads and other little ornaments. Each fruit contains one seed. Egyptian bdellium (see BDELLIUM) is said to be an exudation of this palm.

DOOMSDAY-BOOK: for DOMESDAY, which see.

DOON, *dôn:* Scotch river, rising in the s.e. of Ayrshire in Loch Enoch. It runs n.w. through Loch Doon (5 m. long, three-quarters of a mile wide, amid treeless mountains), past Dalmellington, Burns's Monument and Alloway Kirk, to the Firth of Clyde two m. s. of Ayr. It is 30 m. long. On leaving Loch Doon, the river flows through Glen Ness, a huge rocky and wooded ravine, not surpassed in picturesque beauty by any scenery in Scotland. On an islet in the loch are the ruins of Doon Castle, where Edward, brother of Robert Bruce, is said to have lived. Burns has immortalized the Doon in song.

DOOR, n. *dōr* [Goth. *daur;* Ger. *thor;* Skr. *dvâr;* Gael. *dorus;* Gr. *thura,* a door]: an opening into a house or other building, or into a room or closet of a house; the movable valve of wood or metal which closes an entrance. DOOR'-LESS, a. deprived of a door. DOOR-NAIL, the plug, plate, or knob on which a door-knocker strikes. DOOR-FRAME, n. in *carp.*, the structure in which the panels are fitted. It is composed of the stiles, or upright pieces at the sides; the munnions, or central upright pieces; the bottom rail, the lock or central rail, and the top rail; the case into which the door is fitted. DOOR-KEEPER, one who guards an entrance; a porter; a janitor; in legislative bodies in the United States, officer chosen by vote of the body, or appointed by official authority, to have charge of the rooms: he announces messages (from the president, governor, etc.), dispatches documents, and is an assistant of the sergeant-at-arms in keeping order. DOOR-PLATE, a metallic plate on the outside of a door with the name of the occupant engraved upon it. DOOR-ROLLER, a suspension device for a sliding-door, in which the roller of the door-hanger runs on a track-plate or rod. DOOR-SILL, the threshold. DOOR-STEAD, the entrance of, or the parts about, a door; a doorway. DOOR-STRIP, a strip attached near the lower edge of a door to shut down tightly upon the threshold beneath when the door is closed. DOORWAY, n., the entrance into any building; means of approach. DOORWAY-PLANE, in *arch.*, the space included between the intrados of a large archway and the actual door of entrance. WITHIN DOORS, in the house. WITHOUT DOORS, out of the house. TO LIE AT THE DOOR, to be imputable or chargeable to one. NEXT DOOR TO, bordering on; near to. WITH CLOSED DOORS, in private.

DOOR, *dōr,* and DOOR'WAY, in Art: opening into a building or apartment. The form of the doorway is determined by the architectural style of the building. In classical buildings, it is generally rectangular in form, though both Greeks and Romans, following the Egyptians,

among whom the practice was almost universal, occasionally diminished the opening toward the top; and the Romans, in later times, very frequently threw over it the circular arch, which was the characteristic feature of their style. Egyptian doorways are known to us, for the most part, only by the examples which remain in monumental structures; and these, like the other members of the style as thus exhibited, are of gigantic proportions. The doorway of the temple at Edfu measures 74 ft. to its summit, but the lintel and cornice which cover it are so deep and massy as to occupy a space of no less than 23 ft., so that the height of the aperture is only 51. With the Egyptians, the doorway was an architectural object of very great importance. On either side of it, colossal statues or obelisks were placed, and the approach to it was often lined with rows of gigantic sphinxes.

The Greek doorway was surrounded by moldings, and as the lintel or top-stone which covered it projected on both sides beyond the jambs, the moldings which ran round both jutted out, forming a sort of shoulders. This arrangement, however, was by no means uniform, the moldings of the jambs being frequently quite separated from those of the architrave, as in the beautiful door-way of the Erechtheium. The doors themselves, in antiquity, in private dwellings, were generally of wood; and in structures devoted to religious or public purposes, of metal, and occasionally of marble. They were generally panelled and turned on pivots working in sockets. With the exception of the forms of the windows, and the tracery and foliage of the pillars, doorways are the most characteristic feature in all the styles of Gothic architecture. In the earliest, which in Britain is called Saxon, and which on the European continent is commonly known as Romanic, they are of course very plain. There is seldom more than a few simple moldings, surrounding a semi-circular arch, and in some of the earliest examples, the head of the opening is covered by two flat stones leaning upon each other in the centre, and their other ends being placed on the imposts, so as to form a triangle. In the Norman style, they become gradually more ornamental. The arch still continued in general to be semicircular, though there are a few instances of the segmental or horseshoe arch. As the style advanced, the moldings and enrichments became more various. Of these, that which is most characteristic of the style is the zigzag molding. Circular or octagonal shafts were now frequently placed in the jambs, and these, too, were often ornamented with zigzag or spiral moldings, their capitals being enriched with foliage or grotesque heads or figures. The opening of the doorway often does not rise higher than the springing of the arch, and in this case it is generally flat, the semicircular space between it and the arch being frequently ornamented with a sculptured representation of some scriptural subject. The few Norman doors that exist are devoid of ornament, with the

exception of projecting nails, and a simple iron scrollwork projecting from the hinge, and stretching to a greater or less extent over the door. As the doorway adheres strictly to the characteristics of the style, early English doorways of course generally terminate in pointed arches. In these the moldings are more numerous, the jambs contain a greater number of small shafts, some of which occasionally stand quite free, and on the whole the work is richer in form, and more finished in execution. The opening of the doorway is now frequently divided into two, either by a single shaft or a clustered column. In the decorated style, the doorways are not in general so deeply recessed as in the early English; and this takes from them in richness more than they gain in elegance by their greater height, and by the more delicate character of their ornamentation. In these, the moldings are commonly enriched with flowers or foliage, either in running patterns or placed separately at short intervals. Of these, the commonest are the ball-flower (q.v.), and a flower of four leaves, which often projects boldly, and produces a fine effect. The iron scrollwork on the doors resembles that in the former style, except that the terminations are more frequently worked into leaves or flowers. In other cases the doors are panelled, and covered with characteristic tracery. In the perpendicular style, though the arch continues arched, it is usually placed under a heavy square external molding. The doorway in this style loses much of the depth and richness which belongs to it in the earlier styles. Shafts are used in the jambs, though not always, and they are generally small and few in number; the capitals of the jambs rarely possess the same richness of foliage, and frequently consist merely of plain moldings. One or more large hollows are often left in the jambs, forming small niches, which frequently contain statues. This latter characteristic seems peculiar to the perpendicular style. In the doorways, as well as in the windows of this style, the four-centered arch came into general use, but two-centered arches, and, in small doorways, ogees, are frequently seen. The doors in the perpendicular style, when ornamented, are usually panelled, the upper parts being sometimes covered with tracery, entirely lacking the fine iron scrollwork of the earlier styles.

The door is the movable panel by which the opening to a building, apartment, closet, or passage is closed. Doors are made of wood, iron, bronze, or stone. When moving horizontally on hinges, they are called *swing*-doors; when two such are used to close the opening, they are *folding*-doors. *Sliding*-doors are those which move on rollers, and may be pushed aside. A *jib*-door is one concealed as much as possible when shut. A *trap*-door is one which opens vertically over a horizontal opening, as a hole in the floor, etc. When a small door closes an opening cut in a larger one, it is usually called a *wicket*.

Doors are commonly of wood. The most simple is of several boards joined together at the edges by a *rebate*, or

a *plowed and tongued groove*; these are held together by a transverse piece simply nailed to each board; this is called a *ledge*, and a door thus made, a *ledge* door. These are commonly used for workshops, stabling, etc.; but when durability and appearance are to be combined, a stout frame is first made, its parts joined together by mortise and tenon. This frame has one or more openings—often four—filled with thin pieces called *panels*, fitted into grooves plowed in the edges of the frame. The horizontal pieces of the frame are, according to their position, called the top-rail, bottom-rail, lock-rail, and frieze-rail. The lock-rail is that of which the lock is fixed, the frieze-rail intermediate between the middle and top-rail in large doors. The extreme vertical parts of the frame to which the rails are fixed are called *stiles*, and the intermediate vertical part, a *mounting*. Doors are named one, two, four, six, etc., panelled doors, and are further described by a kind of molding which surrounds the panel, and from the description of panel. The main object of framing, besides appearance, is to counteract the tendency of the wood to warp, by binding the different parts together with pieces having their fibres at right angles to each other.

In many old buildings, the outer, and even some inner doors are made of massive oaken planks, bound together with ornamental iron straps. Iron doors are used chiefly for protection against fire. For this purpose, they are best made of wrought iron, with double sides. Bronze doors, sometimes used for churches and other large buildings, are usually ornamented wth castings in high and low relief. Those of the Baptistery of the cathedral of Florence, by Ghiberti, and the Pantheon of Rome, are among the most celebrated examples. Marble doors are seen chiefly in cemeteries and some Belgian churches.

DOO'RA: see DURRA.

DOORBA, *dôr'ba*, or DOORDA, *dôr'da*, or DURVA, *dôr'-va:* see CYNODON.

DOORGA, or DOORGAH, or DURGA, *dôr-ga* [Bengalee, etc. —from Skr. Properly the application for a giant slain by Doorga, to whom, consequently, his name was transferred. Some suppose that in its wider meaning it implies that which is difficult of approach, inaccessible, impenetrable, or unattainable; or it may be from the Skr. particle *dur* difficult, troublesome; and *gam*, to be known, or it may be from *dur*, bad, vile, ill, and *gai*, to sing, Doorga being extolled in the hymns and songs of the wicked]: in *Hindu myth.*, principal wife as well as the mother of Siva, one of the gods belonging to the Hindu triad. The name Doorga is her appropriate appellation in Bengal, but in southern and western India she is generally Purwutee, or Parvati. Her great exploit was slaying the giant Doorga: see DOORGA POOJAH. Doorga has other names, among which is Bhagabati, and Kalee, or Kali.

DOORGA POOJAH, n. *dôr'ga pôja* [Bengalee —from Skr. *doorga* (q.v.) and *poojah*, worship]: in *Hindu festivals*,

the worship of Doorga, and the festival at which that worship chiefly takes place. According to the Rev. A. F. Lacroix, of Calcutta, the image of the goddess is usually made of clay, in the shape of a female with ten arms

DOORIAH, n. *dôr'ĭ-ah* [various Indian languages]: a cotton cloth made in India.

DOORN, *dōrn*, in English, *Thorn:* common name in s. African geography. It indicates various communes in the Cape Colony. It also designates two rivers, distinguished as *Great* and *Little*, both joining the Olifant, or Elephant, on the right, but the smaller from the s.e., and the larger from the n. e.

DOORM'BOOM (*Acacia horrida*): most common tree in the wastes of s. Africa. The name Doornboom (*Thorn tree*) given to it by the Dutch colonists, and the botanical specific name, are due to the number and sharpness of its spines. It seldom much exceeds 30 ft. in height, but its timber is hard and tough, and is much used for house-carpentry, etc. See ACACIA.

DOP, n. *dŏp:* in *diamond-cutting*, the copper cup in which a diamond is soldered when it is to be polished.

DOPPLERITE, n. *dŏp'plĕr-īt* [named after B. *Doppler*, the first to bring them to notice, and Eng., etc., suff. *-ite*]: in *mineral*, an amorphous mineral occurring in elastic or partly jelly-like masses; found in peat-beds in Styria and Switzerland; hardness 0.5; sp. gr. 1.089; after drying, hardness, 2—2.5; sp. gr. 1.466. When fresh, it is brownish-black, with a dull brown streak and greasy subvitreous lustre; insoluble in alcohol or ether. Dopplerite is also the name of a variety of hircite, grayish, earthy and plastic in the fingers when fresh.

DOQUET, n. *dŏk'ĕt:* warrant; paper granting license: see DOCKET.

DOR, or DORR, n. *dŏr* [AS. *dora*, a drone, a locust: Gael *dùrdan*, humming noise: Ir. *dordam*, to hum like a bee]: a drone bee; a beetle or cockchafer—so called from the humming sound made by animals of this class in flying: see DUNG-BEETLE.

DOR, n. *dawr* [*etym.* doubtful, but probably connected with *dor* (q.v.), the insect]: a trick; a joke; a mock imprecation: V. to cheat; to trick; to make a fool of.

DOR, *dawr*, or MONT DOR, *mōng dawr* (often written less properly Mont d'Or): chain of mountains in France comprised in the great group of the Auvergne (q.v.) Mountains in the dept. of Puy-de-Dome. They are clearly of volcanic formation, and rise in the Puy-de-Sancy, highest peak of central France, 6,190 ft.

DORA D'ISTRIA: see GHIKA, HELENA.

DORADO, n. *dŏ-rā'dō* [Sp. *gilt*—from *dorar*, to gild: L. *deauro*—from *aurum*, gold]: a rich man; in *astron.*, the Sword-fish, a constellation in the southern hemisphere. It is also called Xiphias; in *ich.*, a species of fish of the genus *Caryphæna*.

DORAK, *dō'râk:* town of Persia, province of Khuzistan, on a marshy plain at the junction of the Dorak river with the Jerrahi. It is surrounded by a mud-wall, and defended by a fort. By a canal which unites the Dorak with the river Karun, considerable trade is carried on. Dorak is also reported to have thriving manufactures. Pop. 6,000.

DORAN, *dō'ran,* JOHN, PH.D.: 1807-1878, Jan 25; b. London; descended from an old Irish family of Drogheda: copious contributor to miscellaneous literature. In early life he resided in France and Germany, and was educated chiefly by his father. So early as 1822 he produced the melodrama of *The Wandering Jew,* and at the age of 20 became the editor of the *Literary Chronicle.* In 1835 he wrote a history of Reading, but from that time till 1854 he confined his labors to the periodical press. In the latter year he published *Habits and Men,* followed by *Table Traits and Something on Them. Lives of the Queens of England of the House of Hanover* appeared 1855; *Knights and their Days,* 1856; *Monarchs Retired from Business,* 1857; *History of Court Fools,* 1858; *New Pictures and Old Panels,* 1859; *The Princes of Wales,* 1860; *Memoir of Queen Adelaide,* 1861. In 1864 he produced *Their Majesties' Servants,* a history of the stage from Betterton to Kean; 1868, *Saints and Sinners;* and 1873, his most interesting work, an account of Mrs. Montague and the 'blue-stockings' of her day, under the title of *A Lady of Last Century.* In 1876 he published *Mann and Manners,* the letters of Sir Horace Mann to Horace Walpole. His last work, *London in Jacobite Times,* appeared in 1877. Besides being a large contributor to miscellaneous literature, Doran several times edited the *Athenæum,* and at his death was editor of *Notes and Queries.*

DORCAS SOCIETY, *dawr'kas so-sī'ē-tĭ:* association of women who supply clothes to necessitous families. The name is taken from Acts ix. 39: 'And all the widows stood by him weeping, and showing the coats and garments which Dorcas made, while she was with them.'

DOR'CHESTER, DANIEL, American Methodist clergyman: b. Duxbury, Mass., 1727, March 11; d. 1907, March 13. He was educated at Wesleyan University and entered the Methodist ministry in which he was prominent as pastor and presiding elder. He was at various times a member of the Connecticut Senate and the Massachusetts House of Representatives and has published: *Concessions of Liberalists to Orthodoxy* (1878); *Problem of Religious Progress* (1881); *Latest Drink Sophistries versus Total Abstinence* (1883); *The Liquor Problem in All Ages* (1884); *The Why of Methodism* (1887); *Christianity in the United States* (1888).

DORCHESTER, *dawr'chĕs-tẽr:* formerly a separate town of Mass., was in 1869 annexed to the city of Boston: see BOSTON.

DOR'CHESTER: municipal borough (till 1885, parliamentary also), county town of Dorsetshire, England; 8 m.

n. of Weymouth. It has considerable trade in ale and beer, and sends much butter to London. Dorchester was the Roman *Durnovaria* or *Durinum*, a walled town with a fosse, and a chief Roman British station. Parts of the wall, six ft. thick, remained till 1802. Near Dorchester are the remains of the most perfect Roman amphitheatre in England, 218 by 163 ft., and 30 ft. deep, the seats rising from the arena, cut in the chalk, and capable of holding 13,000 spectators. There is also a Roman camp with a ditch and a high vallum. Near Dorchester is a large British station with three earthen ramparts, a mile and a half in circuit, and pierced by intricate passages, and inclosing barrows. The inner rampart is 60 ft. high. At Dorchester, in 1685, Judge Jeffreys, in his 'bloody assize,' sentenced to death, in two days, 109 persons implicated in Monmouth's rebellion. Pop. (1901) 9,458.

DORDOGNE, *dawr-dōn'*: river of France, formed by the Dor and Dogne rivers in the dept. of Puy-de-Dôme, flows s.w. and w. through the depts. of Corrèze, Dordogne and Gironde, and after a course of over 200 m., of which 150 m. are navigable, enters the Gironde river 13 m. n. of Bordeaux.

DORDOGNE, *dawr-dōn'*, F. *dor-dōñ'*: dept. in the s.w. of France, formed of the ancient province of Périgord, with small portions of Limousin, Angoumois, and Saintonge; 3,546 sq. m. The surface is for the most part hilly, and covered with broom and underwood, with here and there a valley of extraordinary beauty and fertility, inclosed with hills, the sides of which are generally clothed with vineyards. There is a great deficiency of grain, but the want, as an article of food for the inhabitants, is supplied to some extent by the immense produce of the chestnuts, which, with the walnut and the oak, are the prevailing trees in the forests. The climate is generally mild. Mines of coal, iron, and manganese are worked; marble, alabaster, and millstones are quarried. The manufactures are coarse woolens, hosiery, brandy, oil, paper, etc. Dordogne has considerable trade in iron, wine, hams, and truffled turkeys. It has five arrondissements—viz., Bergerac, Nontron, Périgueux, Ribérac, and Sarlat, with Périgueux as capital. Pop. of dept. (1901) 452,951.

DOR'DRECHT: see DORT.

DORÉ, *do-rā'*, PAUL GUSTAVE: 1832–1883, Jan. 23; b. Strasburg: French artist of great and versatile power. He was educated at Paris, and very early gave indication of superior ability. His first attempts were sketches, contributed to the *Journal pour Rire* and other Paris periodicals. In 1855, he exhibited his picture *Battle of the Alma*, followed by *Battle of Inkermann* 1857. In this year first he was heard of in England by the reissue of his illustrations of the legend of the *Wandering Jew*, the power of weird and grotesque imagination displayed in which could not fail to arrest attention. The success of this work seems to have determined his future career and there-

after he worked chiefly as an illustrator. His productiveness in this field is amazing. He illustrated editions of *Rabelais*, of the *Contes Drolatiques* of De Balzac, of Dante's *Divina Commedia*, of *Don Quixote*, of Lafontaine's *Fables*, of Milton, and of the Bible—all of which bear the impress of Doré's original genius. He illustrated also Tennyson's works, Coleridge's *Ancient Mariner*, the *Legend of the Wandering Jew*, beside executing a vast mass of miscellaneous work. *Christ leaving the Prætorium* is his most important painting. There was a Doré Gallery in London for many years, where his designs were exhibited. In 1861 Doré received the decoration of the Legion of Honor. He was the most fertile and vivid designer the world has seen, and the work which he has left is enormous. As a painter, he was a failure in France, as with most persons of educated taste—his pictures being scenic representations. He had real gifts as a sculptor.

DOREE: see DORY.

DOREMA, n. *dōr-ē′ma* [Gr., a gift, in allusion to the product of the plant]: in *bot.*, genus of plants, belonging to order *Umbelliferæ*. D. *ammoniacum* yields gum ammoniac.

DOREMUS, CHARLES AVERY, PH.D.: American: chemist: b. New York 1851, Sep. 6; son of ROBERT OGDEN DOREMUS. After graduating, 1870, at the College of the City of New York, he studied in the universities of Leipsic and Heidelberg, taking the degree PH. D. at Heidelberg 1872. He was prof. of chem. and toxicology in the Univ. of Buffalo (1877-82), in Paris and then became asst. prof. of chem. in the College of the City of New York, lecturer on chem. and toxicology in the Bellevue hospital med. coll., prof. of chem. in the Amer. veterinary coll., etc. His writings on technical subjects are numerous and valuable.

DOREMUS, ROBERT OGDEN, M.D., LL. D.: chemist: b. New York 1824, Jan. 11; d. there 1906, March 22; son of SARAH PLATT DOREMUS. He graduated 1842 at the New York univ., and 1843-47 was asst. in the med. dept. He spent a year 1847-8 in the study of electro-metallurgy and of the processes of chemical manufacture. He opened a laboratory in New York 1848 for giving practical instruction in analytical chem. and for making commercial analyses; became prof. of chem. in the college of pharmacy 1849; received the degree M.D. 1850, and founded in the New York univ. a laboratory of analytical chem. for med. students. He was one of the founders of the Long Island college hospital 1859, and for several years a lecturer therein; became prof. of chem. and toxicology in Bellevue hospital med. coll. 1861, and 1862 was appointed also to the chair of chem. and physics in the College of the City of New York. He invented in 1862 a compressed granulated gunpowder which was adopted by the French govt. and patented various chemical fire extinguishers. He actively promoted sanitary improvements in New York and introduced new methods of disinfecting hospitals and infected

ships. At Bellevue hospital he established a toxicological laboratory for specially accurate work in cases of poisoning. He was an expert witness in many celebrated criminal trials and a brilliant lecturer on scientific subjects.

DOREMUS, Sarah Platt (Haines): philanthropist: 1802, Aug. 3—1877, Jan. 29; b. New York; daughter of Elias Haines, merchant, of New York. She became the wife of Thomas C. Doremus, merchant, 1821. In a season of distress in Greece 1828 she organized a relief mission for distributing supplies; was for several years a generous supporter of the mission founded at Grande Ligne, Canada, by Henriette Feller; founded in New York 1842 a home for women discharged from prison, and 1850 was one of the founders of a house and school of industry for poor women. She was associated with Dr. J. Marion Sims 1855 in establishing the Woman's Hospital, and became pres. of that institution. During the civil war she was active in hospital work. She founded the Woman's Union Missionary Soc. 1860 for unsectarian work among women in heathen lands; was for many years manager of the woman's branch of the City Mission and Tract Soc. and of the Female Bible Soc.; and took active interest in the success of the Gould Memorial, an institution designed to provide free schools for children of Italian immigrants.

DORHAWK: see Goatsucker.

DORIA, *do'rē-â*, Andrea: 1468–1560; b. Oneglia: noble Genoese, one of the greatest admirals of his age. At an early age, he took service in the guard of the pope, Innocent VIII., and afterward distinguished himself in the battles against the Milanese and the French by Genoa and the kings of Aragon. It was Doria who, 1503, after a short campaign, crushed the rebellion in Corsica. When Genoa, 1513, threw off the French domination Doria was appointed capt.-gen. of the galleys, in which capacity he carried on a war of extermination against the dangerous swarms of African pirates who infested the Mediterranean. During the war between Francis I., king of France, and Charles V., emperor of Germany and king of Spain, Doria commanded the French fleet, reinforced by his own galleys, and inflicted everywhere severe losses upon the enemy. After the defeat of Francis I. near Pavia, Doria accepted the command of the papal fleet; but upon the return of the king from his captivity, entered once more the French service, with the title of high admiral of the Levant. He blockaded Genoa, for having espoused the cause of the emperor, and putting to flight the party of the Adorni, took the town. On finding the independence of his country threatened by the French, Doria with his whole force went over to the emperor, and by so doing hastened the deliverance of Italy from French domination. In 1529, Doria entered Genoa, without resistance, and refusing the title of sovereign, offered by the emperor, established there a popular form of government, which remained in vigor till the end of the republic. The grateful

country decreed him the title of 'Father of Peace,' and the emperor, in whose service Doria continued, conferred upon him the order of the Golden Fleece, together with the principality of Melfi. In 1532, Doria won a decisive victory over the Turks near Patras, and the conquest of Tunis (1535) was chiefly his work. He took part in the joint expedition against the Turks under Barbarossa 1536, and in another against Algiers 1541, where he lost 11 of his own galleys. The tranquillity of his last years was disturbed by the conspiracy of Fieschi. Doria took fierce revenge upon the conspirators for the death of his nephew Gianettino. Doria died without offspring, at Genoa, in his 93d year.

DORIAN, a. *dō′rĭ-ăn:* pertaining to *doris,* in Greece. Doric, a. *dŏr′ĭk,* pertaining to the Dorians, or to Doris, in Greece; the simplest and oldest order of Greek architecture; a dialect of the anc. Greek language; any rough broad dialect. Dor′icism, n. *-sĭzm,* a phase of the Doric dialect.—The Dorians were one of the four principal peoples of Greece, who took their name, according to the legend, from Dorus, the son of Helen, who settled in Doris; but Herodotus says that in the time of King Deucalion they inhabited the district Phthiotis; and in the time of Dorus, the son of Helen, the country called Histiæotis, at the foot of Ossa and Olympus. But the statement of Apollodorus is more probable according to which they appear to have occupied the whole country along the n. shore of the Corinthian Gulf. Indeed, Doris Proper was far too small and insignificant a district to furnish a sufficient number of men for a victorious invasion of the Peloponnesus. In this remarkable achievement they were conjoined with the Heracleidæ, and ruled in Sparta. Doric colonies were then founded in Italy, Sicily, and Asia Minor. Strikingly as all the four nations of Greece differed from each other in language, manners, and form of government, the Dorians in particular differed from the Ionians. The former preserved a certain primitive solidity and earnestness, but with it something coarse and hard. See O. Müller's *Die Dorier* (2 vols. Breslau, 1824, 2d ed. 3 vols., 1844). The *Doric dialect* bore the same character; it was harsh and rough, while the Ionian was soft and polished, yet the former had something venerable from its antiquity, and was therefore employed in hymns and choruses. In philosophy, the influence of the Doric character was particularly visible in the Pythagorean school and its attachment to the aristocracy. It is no less traceable in architecture in the strong unadorned Doric pillars, which formed so marked a contrast to the slender and decorated Ionian columns. The Doric order was the oldest, strongest, and simplest of the three orders of Greek architecture. See Column: Entablature: Greek Architecture.

DORIAN MODE (or MOOD), or Doric Mood, n.: in *music,* the first of the authentic church tones or modes from D to D, with its dominant A. It resembles the key of D minor, but with B natural and no C sharp. It is

characterized by its severe tone, and is especially suited for religious or warlike music. Many of the old German chorals are written in this mode.

DORIDÆ, n. *dō′rĭ-dē:* in *zool.*, the Sea-Lemons, a family of naked-gilled gasteropod mollusks. DORID, n. a mollusk of the family *Doridæ.*

DORIPPE, n. *dō-rĭp′pĕ* [*etym.* unknown]: genus of short-tailed decapod crustaceans.

DORIS, *dō′rĭs:* small mountainous dist. of ancient Hellas, between Phocis, Ætolia, Locris, and Thessalia; earliest home of the Dorians. With its four towns, Boium, Cytinium, Erineus, and Pindus, it formed the Doric Tetrapolis, afterward completely destroyed by the Macedonians, Ætolians, and other nations, so that at the time of the Romans, only a few remains of these towns were visible.

DORIS was the name also of a dist. in Asia Minor on the coasts of Caria, inhabited by colonists from the Peloponnesus; it formed a *Hexapolis.*

DORIS in modern Greece, forms an eparchy of the govt. of Phocis.

DORIS, *dō′rĭs:* genus of gasteropodous mollusks of the order *Nudibranchiata*, the type of a family called *Doridæ*, sometimes popularly SEA-LEMONS. The body is oval, the abdomen flat, the back flat in some and elevated in others, the mouth a small proboscis with two small tentacula, the vent situated in the back, and surrounded by a circle of branched or plumed gills. The species are found in all seas, many in those of Britain; but they are more numerous in the s. hemisphere. Some attain a considerable size. Few inhabit deep water. They crawl on rocks, seaweeds, etc., where they are often left by the tide, or swim in a reverse position; the foot, made concave by muscular action, serving to buoy them up. Some are pretty and interesting inmates of the aquarium. Gosse mentions, that specimens of *D. bilamellata* were 'very social in confinement, continually finding out one another, and crowding close up together.'

DORIS: in *myth.*, a goddess of the sea, daughter of Oceanus and Tethys, and wife of Nereus, by whom she had 50 daughters, called Nereids; in *astron.*, an asteroid, the 47th found. It was discovered by Goldschmidt.

DORKING, *dawr′kĭng*, or DARKING, *dâr′kĭng:* town in England, in the middle of Surrey, in a picturesque valley on the left bank of the Mole, 23 m. s.w. of London by road. It lies on the Roman road which ran between London and Chichester. Its chief trade is in flour, lime, and chalk from the adjacent pits. Dorking gives its name to a peculiar breed of domestic fowl: see POULTRY. Pop. (1901) 7,670.

DORLACH, or DORLOCH, n. [Gael. *dorlach*, a bundle]: a bundle; apparently that kind of truss formerly worn by the Highland troops instead of a knapsack; a portmanteau; a short sword; a dagger.

DORMANT, a. *dŏr′mănt* [F. *dormant*, sleeping –from L. *dormĭĕns* or *dormĭen′tem;* It. *dormente*, sleeping—from L. *dormīre*, to sleep]· sleeping; inactive; sluggish; at rest; quiescent; suspended; not exercised, as a dormant peerage: in *heraldry*, an animal dormant has its head resting on its forepaws, whereas an animal couchant has its head erect. DOR′MANCY, n. *-măn-sĭ*, quiescence; sleep; abeyance. DORMANT-BOLT, n. a concealed bolt working in a mortise in a door, usually operated by a key, sometimes by a turning knob. DORMANT-CLAIM, n. in *law*, a claim in abeyance. DORMANT-LOCK, n. a lock having a bolt that will not close of itself. DORMANT-PARTNER, n. in *com.*, a partner in any business whose name does not appear in the title, and who takes no active part in the management of the concern, but is entitled to a share in the profits, and also liable to a share in the losses, more commonly called a sleeping or silent partner. DORMANT-STATE, n. in *nat. hist.*, a state of torpidity in which hibernating animals pass a certain portion of the winter. DORMER, or DORMER-WINDOW, *dŏr′mĕr* [F. *dormeur*, a sleeper]: an upright window placed in a small gable rising out of a sloping roof, giving light to the chambers next the roof; an attic window sometimes known as a storm-window. Dormers appear to have been invented not before the middle of the 14th c.; called also DORMANT-WINDOW. DOR′MITORY, n. *-mĭ-tĕr-ĭ* [L. *dormĭtōrĭŭm*, a sleeping-chamber; prov. Eng. *dormedory*, a sleepy person; prov. Sv. *dormeter*, sleepy]: a sleeping-room; a series of sleeping-places in a building. The term was applied especially to sleeping-apartments in monasteries.

DORMAN-TREE, n.; a large beam lying across the ceiling of a room, and serving as a joist; a dormond or dormant-tree.

DOR′MANT VITAL′ITY: peculiar condition manifested by many organized beings, and which is characterized by an apparent suspension of all the vital actions. Beings in this state can scarcely be said to be *alive*, since they exhibit no vital activity, nor can they be designated as *dead*, since that implies their incapability of resuming their former state; hence, since they retain their peculiar attributes without manifesting them, the term dormant vitality seems appropriate for them. This condition may result either from the withdrawal of the stimuli necessary for the maintenance of vital actions (as water, heat, etc.), or it may proceed from some change in the organism itself, whereby its power of responding to these stimuli is for a time diminished or lost. The following are examples of each kind of dormant vitality.

1. Dormant vitality from the withdrawal of the necessary stimuli. Seeds of certain plants, properly protected from air, moisture, and extremes of temperature, remain dormant, retaining their vitality for a period varying greatly with different varieties, ranging from two weeks as in the case of seeds of the willow tree, to more than a century with those of some leguminous plants. Wheat re-

tains its vitality for an indefinite period. Seeds deeply buried, sometimes grow after lying dormant for a very long period. This is seen in the spontaneous growth of deciduous trees where an evergreen forest has been removed, and in the growth of evergreens on land which for a century has been covered by a forest of oaks. Dr. Lindley, an English botanist, mentioned three raspberry plants which had been grown 'from seeds taken from the stomach of a man whose skeleton was found 30 ft. below the surface of the earth.' As some coins of the emperor Hadrian were found in the burial place it is thought that the seeds were 1,600 or 1,700 years old. An instance of the growth of seeds which had lain dormant for ages instead of centuries is quoted by Dr. Carpenter in his *General and Comparative Physiology*. In digging a well in a town about 40 m. from the coast of Maine a stratum of sand was struck at a depth of about 20 ft. A quantity of this sand was spread upon the surrounding soil and from it there sprang a large number of beach-plum trees. This variety had never before been seen except at the shore. The seeds must have been borne by trees which occupied the spot when it formed the coast and have retained their vitality in a dormant state through the countless years during which the ocean had been receding to its present position.

Once lost, the vitality of seed can never be restored, though it can sometimes be stimulated to activity after being weakened by age. The vitality of coffee soon becomes impaired, but if soaked in a weak solution of carbonate of ammonia many of the berries will germinate after being kept considerable time. Many old seeds which will not grow under ordinary conditions can be made to germinate by placing them in fatty oils or soaking them from one to ten days in a weak solution of oxalic acid. The condition in which they are kept largely determines the time during which seeds will retain their vitality. Seeds taken to England from India by the land route germinate readily, while those carried by sea are very likely to fail. An excess of heat or moisture destroys the vital principle, while the abstraction of moisture beyond certain limits or a freezing temperature may be equally fatal. It is in consequence of this dormant vitality of seeds that the inhabitants of the temperate zones are enabled to grow many valuable food plants which they could not otherwise produce. Some of our most important plants ripen their seeds long before the time of sowing for succeeding crop. If the vital principle did not remain it would be necessary to sow these seeds at once; and as the young plants would be destroyed by frost, the cultivation of these crops where the winters are cold would be impossible. Dormant vitality is also a quality of the seeds of pernicious plants. A fine sod, apparently free from weeds, may be plowed, and the owners soon find multitudes of foul plants growing from seeds which were ripened when the land was under cultivation many years before and which had ever since been lying dormant in the soil.

DORMANT VITALITY.

Among the lower animals, we find several of comparatively complex structure, in which dormant vitality can be induced for a considerable period, even several years, by the abstraction of their moisture. The well-known rotifer, the wheel-animalcule, may be reduced to perfect dryness, and kept in this condition for a long time (certainly three or four years, and some writers say far longer) without evincing a sign of life, and yet it will immediately revive on being moistened. The *Tardigrades*, an allied tribe, have been desiccated by the most powerful means which chemistry affords, and have been then heated to a temperature of 250°, and have still been revived by water, though in their active state a temperature of 120° destroys them. In Woodward's 'Manual of the Mollusca,' cases are recorded of living snails crawling out of shells supposed empty, and in which they must have been dormant for several years; and the eggs of snails and others of the lower animals have a still greater power of revivification after drying. Sir James Emerson Tennent describes various fishes in Ceylon which bury themselves in the mud when the pools or tanks dry up, and remain torpid until the periodic rains of that country ensue, and previous observers had noted similar facts in other tropical countries. Humboldt relates that crocodiles and boas are sometimes found alive, though torpid, in hardened mud, and revive on the application of water.

A diminution of temperature will induce this phenomenon in many animals In one of Captain Sir James Ross's voyages, several caterpillars having been exposed to a temperature of 40° below zero, froze so completely, that when thrown in a tumbler they clinked like lumps of ice. When thawed, they resumed their movements, took food, and later became transformed into the chrysalis state. One of them, which had been frozen and thawed four times, subsequently became a moth. In the N. American lakes, frozen fishes are often found in the ice, which revive when gently thawed. Spallanzani kept frogs and snakes in a torpid state for three years in an ice-house, and then revived them by warmth.

The same capability does not exist, at all events to the same extent, in the warm-blooded animals. A total suspension of vital activity in a bird or a mammal for any length of time, from the prolonged application of severe cold, or from any other cause, is never followed by recovery. The stories of certain birds burying themselves in the mud during winter, are regarded by the best authorities as more than questionable; and in hibernating mammals (see HIBERNATION), the suspension is not total. How we are to explain, or whether we ought to believe, the remarkable cases of certain Indian fakirs, who are stated to have the power of suspending all their vital activity for days, or even weeks, we do not know. The late Mr. Braid of Manchester published a collection of these cases, directly obtained from British officers who had been eye-witnesses of them in India, in his 'Observa-

tions on Trance or Human Hybernation,' 1850. We quote one of these, vouched for by Sir Claude Wade. The fakir was buried in an underground cell, under strict guardianship for *six weeks;* the body had been twice dug up by Runjeet Singh (at whose court the exhibition took place) during the period of interment, and had been found in the same position as when first buried. In this and in all the other recorded cases, the appearance of the body when first disinterred is described as quite corpse-like, and no pulsation could be detected at the heart, or in the arteries. The means of restoration employed were chiefly warmth to the vertex, and friction to the body and limbs.

2. Dormant vitality from changes within the organism. The insect world affords us the chief illustrations of this variety of dormant vitality. The pupa or chrysalis stage of insect life is in itself one of dormant vitality, unconnected with any of the external influences above noted. That this stage may be much shortened by artificial heat, and prolonged by artificial cold, has been known since the time of Reaumur; but, as the following case shows, there are other causes inherent in the animal itself, which tend at a certain time to prolong the pupa condition. In the *Papilio Machaon* there are two generations every year; for the butterfly that comes forth in the early summer lays eggs which rapidly pass through all the phases of insect life, and produce another set of eggs later in the season, whose larvæ or caterpillars turn into pupæ before the winter. The pupa stage of the first brood (in July) lasts only 13 days, while that of the second brood (which commences in September) lasts nine or ten months, the butterfly not appearing until the following June. The difference of temperature is obviously quite insufficient to account for the great diversity between the two periods. Several similar cases may be found in Kirby and Spence's "Entomology."

DORMOUSE, n. *dŏr'mows*, DOR'MICE, n. plu. *mīs* [L. *dormĭō*, I sleep, and *mouse:* but probably OF. *dormeuse;* Lang. *dourmeire*, a slumberer, a sleepy head (see DORMANT)], (*Myoxis*): genus of rodent quadrupeds, ranked by some naturalists in the family *Muridæ* (rats, mice, etc.), and by others in the family *Sciuridæ* (squirrels, etc.); being, in fact, a connecting link between the two families. Their habits resemble those of squirrels; the dentition, however, more nearly agrees with that of mice. There are four molar teeth on each side in each jaw; the upper jaw has not the anterior rudimentary fifth molar, characteristic of squirrels. The molars have their summits marked by transverse ridges. There are no cheek-pouches. The ears resemble those of mice. The fore paws have each four toes and a rudimentary thumb, the hind feet have five toes. The fur is very fine and soft. The tail is long, and in the different species exhibits characters variously intermediate between those of mice and squirrels. This genus and the closely allied genus *Graphyurus* are remarkable as the only genera of rodents in which there is no cæcum. The

species of Dormouse are beautiful little animals, natives chiefly of the south of Europe. Some species found also are in Africa, and the genus *Graphyurus* is entirely African. The only British species of Dormouse is the Common Dormouse, Red Dormouse, or Muscardine (*M. avellanarius*), inhabitant of woods in some parts of England. It is about the size of a common mouse, with head proportionally large; has a rather pointed muzzle, large prominent eyes, and a flattened tail, thickly clothed with rather long hair; and is of a tawny red color on the upper parts, and white beneath. It is extremely gentle and easily tamed, feeds on beechmast, acorns, hazelnuts, grain, etc., and spends the colder parts of winter in a state of torpidity, though in mild weather it wakens up to consume a little of the store of food which, like squirrels, it lays up for that season. Before its hibernation begins. it is generally very fat, and it does not become emaciated by hibernating. It makes a nest of tangled or interlaced herbage opening from above, usually in copse or underwood; and produces about four young ones at a birth. It often assumes a remarkable posture in feeding, suspending itself by it hind feet; more generally it sits upon its haunches, and holds its food in its fore-paws. This species is found in all parts of continental Europe, from the Mediterranean to Sweden. The Fat Dormouse (*M. Glis*) is a larger species, grayish brown, about the size of a rat, with tail very like that of a squirrel, native of the south of Europe, where it inhabits forests, leaping from branch to branch with great agility. It is eaten by the Italians, as it was by the ancient Romans, who highly esteemed it, and fattened it for the table in receptacles called *gliraria*.—The Garden Dormouse (*M. nitela*), common in Europe as far n. as Poland, is frequently found in gardens, and even in out-houses. It is often very destructive of the fruit of wall and espalier trees. It is rather smaller than the Fat Dormouse, grayish brown, black round the eyes, and has the tail tufted only at the extremity. All the species of Dormouse hibernate; and from this circumstance the name seems derived.

DORN, n. *dŏrn* [Ger. *dorn;* Dut. *doorn*, a thorn]: the fish thornback.

DORNBIRN, *dawrn'bĭrn:* town of Austria, in the n. w. of Tyrol, about 8 m. s. of the e. extremity of the Lake of Constance; on the Lossen, a small mountain stream. The houses are widely scattered. The women of Dornbirn are chiefly employed in muslin-embroidery; the men are for the most part carpenters, engaged principally in the construction of wooden houses, which are carried in detached pieces to the market town (Bregenz), and are thence exported. Pop. (1900) 13,052.

DORNELL: see Darnel.

DOR'NER, Isaak August, d.d., theologian: 1809, June 20—1884, July 12; b. Neuhausen-ob-Eck, Würtemberg; son of a Lutheran clergyman. He was educated at the Univ. of Tübingen, and was appointed prof. of theol. there 1838, at Kiel, Univ. 1839, Königsberg Univ. 1840, Bonn

Univ. 1847, and Berlin Univ. 1857. In 1873 he came to the United States as a delegate to the meeting of the Evang. Alliance. His theol. writings, which are many and highly esteemed, include a *History of the Development of the Doctrine of the Person of Christ* (1839), *History of Pietism, especially in Würtemberg* (1840), *The Principle of Our Church* (1841), *History of Protestant Theology, especially in Germany* (1867), *Christliche Glaubenslehre* (2 vols. 1880), *Gesammelte Schriften aus dem Gebiet der Systematischen Theologie*, and *Exegese und Geschichte*. Dorner's theological learning was great, and his thought profound. He may be considered the ablest of recent upholders of evangelicalism in doctrine against the rationalism of Germany. His systematic works, greatly admired as a whole, have met earnest criticism in America on a few points of eschatology.

DORNICK, or DORNIC, *dawr'nĭk*, or DORNOCK *dawr'nŏk;* species of figured linen. Dornicks were formerly made in considerable quantity at Dornich, or Tournay, in the Netherlands; hence their name. From this place, the manufacture was probably carried to Norfolk by the Dutch, who emigrated thither during the persecution of the Duke of Alva. By a statute, 5 and 6 Ed. VI. c. 24, this manufacture, or 'mystery,' carried on at Norwich, is carefully protected. All persons, except those residing in Norwich or Pulham, are forbidden to carry on the 'mystery,' under pain of forfeiture of the article, and of the sum of 6*s* 8*d*. for every six yards so made. By 4 Will. and Mary, c. 5, s. 2 (68), a duty of 10 per cent., in addition to duties previously levied, is laid on all tapestry or dornicks imported, except from France. These stringent provisions are no longer in observance.

DORNICLE: see BLENNY.

DORNOCH, *dawr'noch:* royal burgh and county town of Sutherlandshire, Scotland, near the entrance to the DORNOCH FIRTH—an inlet of the North Sea, running 25 m. inland, and separating Sutherland from Ross-shire. The cathedral stands in the centre of the town, and is an object of considerable attraction. It is said to have been begun in the 11th c. by St. Bar, and was enlarged 1270 by Bp. Gilbert Murray. It was burned 1570, and thereafter partially repaired. In 1837, it was to a certain extent restored by the late Duchess of Sutherland. It is in the shape of a cross, and is surmounted with a tower and clock spire. The interior is fitted up and used as the parish church. Dornoch was, in olden times, the residence of the bishops of Sutherland and Caithness. The w. tower of the bishop's palace stands immediately opposite the cathedral. Next to it is a handsome building, in the old English style of architecture, for the courts of laws and public offices. The town has a neat, clean appearance, and is lighted with gas. It is considered one of the best bathing-places in the north, and has extensive 'links,' fit for archery, golfing, and other exercises. Dornoch is one of the six northern burghs which send a member to

the house of commons. It was constituted a royal burgh by Charles I, 1628. The last victim in Scotland to the laws against witchcraft was burned here 1722. Pop. (1901) 2.794.

DOROGH, *dō-rōg':* town of Hungary, 20 m. n n.w. from Debreezin, in a very fertile district. The people are chiefly engaged in agricultural pursuits. Pop. 8,026.

DOROGOBUSH, or DOROGOBOUGE, *dō-rō-gō-bôzh'·* town of Russia, govt. of Smolensk; on the left bank of the Dnieper, about 50 m. e.n.e. of Smolensk. It is a small town, but pretty, and well built, and has some manufactures. At Dorogobush, the French under Eugene, in their retreat from Moscow, encountered many disasters. Pop. 10,000.

DOROGOI, or DOROHOY, *dō-rō-hō'ē:* town in the n. part of Moldavia, Roumania, on the Shiska river, a tributary of the Pruth, bet. 75 and 80 m. n.w. of Yassy. It is poorly built, does a large trade in the products of n. Europe, and has several annual fairs of local importance. Pop. 15,000.

DORONICUM, n. *do-rŏn'ĭ-kŭm* [Arab. *dorongi*]: in *bot.*, leopard's-bane, genus of composite plants, belonging to the sub-order *Tubuliflorœ*, sub-tribe *Senecioneœ.*

DOROSMA, *dō-rŏsh'mō:* town of central Hungary, Little Cumania 6 m. w.n.w. of Szeged. It contains a Rom. Cath. high school. Pop. 13,000.

DORP, *dawrp:* town in the govt. of Dusseldorf, Prussia, on the Wupper r.; annexed to Solignen 1889. Since 1849 it has become an important centre of manufacturing industry, owing largely to the vast coal deposits in its vicinity, and has extensive iron, steel, paper, and tobacco factories. Pop. 15,000.

DORPAT, *dawr'pât*, or DERPT, *dĕrpt* (Russian, *Guriev*, Esthonian, *Tartolin*): town of Russia, govt. of Livonia; on the Embach, here crossed by a fine granite bridge, 150 m. n.e. of Riga. It is built in the form of a semicircle, and consists of a town proper, with two suburbs. Its streets are straight and clean; its houses, mostly of one story, are of brick or wood, have handsome fronts, and are often showily painted. It is the winter residence of the Livonian nobles and gentry. The Domberg Hill, at the n.w. extremity of the town, is tastefully laid out in avenues and promenades; its summit, formerly the site of a cathedral, destroyed by fire in 1775, is now occupied by an observatory, the university library, schools of anatomy and natural history, museums, etc. The observatory—one of the most renowned in Europe, and long presided over by the celebrated Struve—possesses a great refracting telescope, presented by the Emperor Alexander I. The university, founded 1632 by Gustavus Adolphus, suppressed 1656 by the Muscovites, and reestablished by Alexander 1, 1802, is famous. It supports a staff of about 70 professors and lecturers, and is attended by between 800 and 900 students, of every religious denomination, who are taught theology, ethics, law, medicine, natural philosophy, and natural his-

tory. German is employed, except for law. It is also the chief school of the Prot. clergy in Russia, and the Reformed Synod of Wilna send their students hither. Dorpat has a botanical garden, containing 18,000 plants, some of which are not possessed by any other botanical garden in Europe. Dorpat was formerly a walled town, and the ramparts remain, but have been converted into public walks. The chief employment of the people is in supplying the wants of those connected with the university. Pop. 45,000.

DORR, *dawr*, Julia Caroline Ripley: b. Charleston, S. C., 1825, Feb. 13: author. She removed with her father to Rutland, Vt., while a child, married Seneca R. Dorr 1847, and became a contributor to magazine literature 1848, when she took a $100 prize offered by *Sartain's Magazine* with the prose tale *Isabel Leslie*. Her prose and poetical works have since comprised *Farmingdale* (1854), *Lanmere* (1856), *Sibyl Huntingdon* (1869), *Poems* (1871), *Expiation* (1872), *Friar Anselm, and other Poems* (1879), *Daybreak, and Easter Poem* (1882), *Bermuda* (1884), *Afternoon Songs* (1885), *Bride and Bridegroom* (1873), *The Flower of England's Face* (1895), *A Cathedral Pilgrimage* (1896), *Afterglow* (1900), *In Kings' Houses* (1898), etc.

DORR, Thomas Wilson: 1805, Nov. 5—1854, Dec. 27; b. Providence, R. I.: lawyer. He graduated at Harvard Univ. 1823, studied law with Chancellor Kent in New York, was admitted to the bar there, and returned to Providence to practice. He was elected a member of the assembly as a federalist 1833, procured passage of a bill curtailing the powers of the state banks, and endeavored vainly to secure the adoption of a more liberal constitution than the restrictive one based on the Charles II. charter and then in force, and became a democrat on leaving the assembly 1837. Failing officially in his new constitution movement, he organized a suffrage party (1840) which called a convention at Providence 1841, Oct. 4, when a constitution was framed. This was submitted to the popular vote in Dec., and received what was asserted to be a majority vote of the adult citizens of the state. Under this constitution Mr. Dorr was chosen gov. 1842, Apr. 18. A constitutional convention was also called by the legislature, but its draft was rejected by the people 1842, Mar. At the regular election under the old law, Samuel W. King was chosen gov. Both governors were inaugurated 1842, May 3, and their adherents immediately rushed to arms. Gov. King called out the militia and proclaimed martial law; Gov, Dorr attempted to seize the state arsenal, but was prevented by the militia; and in an appeal to the federal authorities Gov. King was recognized as the chief executive. Another convention called by the legislature adopted the present constitution Nov. 5, and its ratification by the people put an end to 'Dorr's rebellion.' Mr. Dorr was arrested, convicted of high treason, and (1844, June 25) sentenced to imprisonment for life; but was pardoned 1847, and restored to civil rights 1851.

DORRE ISLAND, *dawr:* north of Dirk-Hartog Island (q.v.) in lat. 25° 10′ s. It is 20 m. long, and forms, like its southern neighbor, part of the breast-work of Shark Bay, in W. Australia.

DORSAL, a. *dŏr′săl* [F. *dorsal*—from L. *dorsālis*—from L. *dorsum;* It. *dorso*, the back]: pertaining to the back, as the *dorsal fin* of a fish. DORSIF′EROUS, a. *-sĭf′ėr-ŭs* [L. *fero*, I bear]: in *bot.*, applied to ferns bearing fructification on the backs of their fronds. DOR′SIFIXED, a, *-fĭkst* [*dorsum*, and *fixed*]: applied to anthers fixed to the filament by their backs, as in the tulip. DORSIP′AROUS, same as DORSIFEROUS. DORSAL-SUTURE, n. *sūt′yôr*, in *bot.*, a suture which faces the perianth of a flower, as opposed to the ventral suture which faces its centre. DORSAL VERTEBRÆ, n. in *anat.*, the vertebræ between the cervical and lumbar vertebræ. DORSAL-VESSEL, n. in *entom.*, in insects, a long blood-vessel or heart lying along the back, through which the nutritive fluid circulates. DORSI LUMBAR, n. *dawr′sĭ-lŭm-bĕr*, in *anat.*, pertaining to the loins and to the back. There is a dorsi-lumbar nerve. DORSI-SPINAL, n. *dawr-sĭ-spīn′al*, pertaining to the back and the spine. DORSI-SPINAL VEINS, n. in *anat.*, veins forming a kind of network round the spinous, transverse, and articular processes and arches of the vertebræ. DORSO-CERVICAL, n. *-sĕr′vĭ-kăl*, pertaining to the back of the neck. DORSO-INTESTINAL, a. *-ĭn-tĕs′tĭnal*, in *anat.*, situated on the dorsal aspect of the intestines. DORSO LATERAL, a. *-lăt′ėr-al*, in *anat.*, connected with the side and with the back. There is a dorso-lateral muscle.

D′ORSAY, *dor-sā′*, ALFRED GUILLAUME GABRIEL, Count: 1801, Sep. 4—1852, Aug. 4; b. Paris: artist and fashion leader. His father was a gen. in the French army, in which he also served several years. In 1822, while on a visit to London, he became acquainted with Lord and Lady Blessington, and in 1827 married the daughter of the former by his first wife. Lord Blessington died 1829, and shortly afterward D'Orsay separated from the daughter and attached himself to the widow. He travelled extensively with her, and was her inseparable companion at Gore House, her famous London residence, as long as she lived. He was one of the handsomest men of his day, and possessed of brilliant talents, was equally noted as a leader in the fashionable life of London and Paris and as a painter and sculptor, and was appointed director of fine arts by Napoleon III. His widow married the Hon. Charles Spencer Cowper, and died 1869, Dec. 17.

DORSE, *dawrs*, or DORSET, or TORSK (from the Gothic *durren*, to dry, and anglicised *Tusk*): Norwegian names of the Cod (*Gadus callarias*), and formerly supposed to be a separate species, less in size than the cod, being seldom more than two ft. in length, but much resembles it in form and color, although its color is more variable, from which it has received the name of VARIABLE COD. It is called also the BALTIC COD. It differs from other cod in

greater length of the upper jaw. It enters the mouths of large rivers. It is in great request on the coasts of the Baltic, being esteemed the best fish of all this family.

DORSEL, n. *dawr'sel* [L L. *dorsale*—from L. *dorsum*, the back]: a pannier; a basket or bag, one of which hangs on either side of a beast of burden for the reception of things of small bulk; a kind of woolen stuff used for hanging curtains, etc.; a canopy or screen of tapestry at the back of a throne or altar; tapestry or wall hangings round the sides of the chancel of a church; a dosel; a cover for a chair-back.

DOR'SET, Earl of: see Sackville.

DOR'SETSHIRE, *dawr'sĕt-shĕr*, or Dorset, *dawr'sĕt:* maritime county in the south of England, on the English Channel, between Devonshire and Hampshire. Its greatest length is 58 m.; greatest breadth, 40; average 21; area, 627,265 acres. One-third is arable, a ninth waste, and the rest in pasture. The coast-line is 75 m. long, with some cliffs and headlands. St. Alban's Head is 344 ft. high. Portland Isle (q.v.) is connected with the mainland by a remarkable formation known as Chesil Bank. The surface is uneven and bleak. Chalk downs run along the s. coast, and through the middle of the county nearly from e. to w. The highest point is Pillesden Pen, 934 ft. The chief rivers are the Stour and the Frome. Geologically, Dorsetshire consists of strata of plastic clay, chalk, oolite, lias, with some weald and greensand. Remains of colossal reptiles have been found at Lyme Regis. The chief mineral productions are the celebrated Purbeck and Portland building-stones, coarse marble, and white china and pipe clays. The climate is mild. The chalk hills or downs are covered with short fine pasture, on which countless numbers of South-down sheep are fed. The soil is chiefly sand, gravel, clay, and chalk. Dorsetshire is mainly a pastoral county, producing sheep, cattle, cheese, and butter; but some wheat, barley, hemp, linseed, hops, etc., are raised. Sanfoin is grown on the chalk hills. There are small manufactures of linen, silk, woolens, flax, hemp, buttons, stockings, and ale and cider. Since 1885, the county sends four members to parliament. The London and S.-western, and Somerset and Dorset railways run through Dorsetshire. Dorsetshire has ancient British and Roman remains, as stone circles, cromlechs, barrows, camps, and amphitheatre, and three Roman stations. There are some remains of 40 abbacies, priories, hospitals, etc. The ruins of Corfe Castle, a seat of the Saxon kings of Wessex, are among the grandest in England. Pop. (1901) 202,962.

DORSEY, Ella Loraine, American author: b. Washington, D. C., 1855, March 2. She early devoted herself to journalism, serving for 10 years on the Washington papers and later in several other cities. She began her specialty of Catholic juvenile fiction in 1886. She has written much prose and verse for the magazines, and

among her published books are: *Midshipman Bob; Jet, the War Mule; The José Maria; Saxby's Angels;* and the *Two Tramps.*

DORSEY, James Owen, American ethnologist: b. Baltimore, Md., 1848, Oct. 31; d. Washington, D. C., 1895, Feb. 4. He was ordained a deacon in the Protestant Episcopal Church, and was engaged in parish work in Maryland from 1873–8. He was then appointed ethnologist to the United States Geological and Geographical Survey of the Rocky Mountains; and after spending some time at the Omaha Reservation in Nebraska, was transferred to the United States Bureau of Ethnology. His chief works are: *On the Comparative Phonology of Four Siouian* (Sioux) *Languages* (1883); *Siouian Folklore and Mythologic Notes* (1884); *Kansas Mourning and War Customs* (1884); *Indian Personal Names* (1886).

DORSIBRANCHIATE, a. *dŏr'sĭ-brăng'kĭ-āt* [L. *dorsum,* the back; Gr. *brangchia,* gills of a fish]: in *zool.,* having external gills attached to the back or sides: this word is of mongrel composition, and *notobranchiate* is the more correct term. This worm lives in sand or mud, and swims in the sea. One species, the Eunice, sometimes attains a length of 4 ft. Another species, the Lob-worm, is much used in Europe for fish-bait. See Invertebrate Animals.

DORSTENIA, n. *dawr-stē'nĭ-a* [named after Dr. T. *Dorsten,* a German botanist]: in *bot.,* genus of plants belonging to the nat. ord. *Urticaceæ.* The receptacle is slightly concave and broad, bearing numerous naked flowers. *D. contrayerva, D. Houstoni,* and *D. brasiliensis* furnish the contrayerva root of commerce. They are natives of tropical America. In pharmacy the rhizome is used as a stimulant, tonic, and diaphoretic: see Contrayerva.

DORSUM, n. *dŏr'sum* [L.]: in *scientific language,* the back; the ridge of a hill.

DORT, *dawrt,* or Dordrecht, *dawr'drecht:* town of the Netherlands, province of S. Holland, on an island formed by the Maas, about 12 m. s.e. of Rotterdam. An inundation in 1421, in which upward of 70 villages were destroyed and 100,000 people drowned, separated the site upon which Dort stands from the mainland. Dort is fortified on the s. side, and its position is naturally so strong, that though frequently besieged, it has never been taken. It is one of the oldest towns in Holland, and some interesting historical particulars attach to it. Here, 1572 the states of Holland, after their revolt from Spain, held their first assembly, and declared the Prince of Orange the only lawful governor of the country. In 1618–9, the conclave of Prot. divines known as the Synod of Dort, met here, and condemned the doctrines of Arminius as heretical, and affirmed those of Calvin. (For an account of the questions at issue, see Arminius.) The Gothic building in which the synod sat, whose miraculous labors, according to the president's closing address, 'made hell tremble,' was long used as a public-house, and the room in which

they met as a dancing-saloon; the house has been destroyed. Among the principal buildings of Dort are a Gothic church with a tall square tower and containing a beautiful marble pulpit, and the town-hall. The town is traversed by canals, and the Rhine and the Maas afford it great facilities for trade. Large ships can go quite up to the quays. Gigantic woodrafts, of value sometimes as much as $150,000 each, obtained from the Black Forests and Switzerland, come down the Rhine to Dort, which has numerous saw-mills, ship building docks, salt and sugar refineries, bleacheries, and manufactures of tobacco, white-lead, etc. It has also considerable trade in corn, flax, oil, timber, and salt-fish. Pop. (1899) 38,386.

DORTMUND, *dawrt′mûnt:* the most important town of Westphalia, on the Cologne and Minden railway, on the Emscher, 47 m. n.n.e. of Cologne. It is the centre of a mining district, with numerous foundries, and the headquarters of the mining authorities of Westphalia. Dortmund was formerly surrounded by massive walls, but the greater part of these have been removed, and the town is now quite modern in aspect. Its history goes back into the earliest middle-age traditions. It figured in the time of Charlemagne under the names of Throtmanni, Tremonia, Trot-munde, and Dortmunde. Subsequently it became a free Hanse town, but was ceded to Prussia 1815, at the Congress of Vienna. The town-hall is one of the oldest in Germany. Dortmund is an important railway centre, and manufactures railway material on a large scale. Coal and iron are wrought in the neighborhood; and in Dortmund are nearly 50 beer-breweries. Pop (1901) 142,733.

DORTY, a *dawrt′ĭ:* saucy; nice; delicate; tender; hard to rear or cultivate (said of plants).

DORY, n. *dō′rĭ* [etym. doubtful]: *naut.*, a small, sharp, flat-bottomed boat with very sloping sides, much used in fisheries.

DORY, *dō′rĭ*, or DOREE, n. *dō-rē′* [F. *dorée*—from *dorer*, to cover with gold], (*Zeus*): a sea-fish of a golden-yellow color, popularly called in Eng. *John Dory*, or *doree*, being a corruption of the French *jaune dorée*, golden yellow. *Note.*—Latham suggests *janitore*, the gate-keeper, a name given to it by the fishermen of the Adriatic, in allusion to St. Peter possessing the keys of heaven, the fish being called St. Peter's fish. In Skeat's opinion, *John* is not from F. *jaune*, but is a mere sailor's expletive, and a familiar application of the personal name *John*, as is so often the case with *Jack*. The Dory is a genus of fishes, type of a family, *Zenidæ*, sometimes regarded as merely a group of the great family of *Scomberidæ*, but at least a very distinct group, characterized not only by an oval and much compressed form of body, but also by a protractile mouth. The teeth are feeble. The species of *Zenidæ* are distributed in the seas of all parts of the world, though only three occur on the British coasts, and two of these are very rare

(see BOAR-FISH and OPAH). In the Dory genus, the general surface of the body is smooth and destitute of scales, but spiny scales or bony shields guard the dorsal and ventral edges. The anterior portions of the dorsal and anal fins are spiny, and are very distinctly separated from the spineless portions; the spines of the dorsal fin are prolonged into long filaments, and the tail-fin is rounded. The British species (*Zeus faber*), popularly known as the JOHN DORY, sometimes attains considerable size: Pennant mentions one which weighed 12 lbs.; but it is seldom seen much more than 18 inches in length. It is found principally on the s. and particularly the s.w. coasts of England, visiting them, apparently, in pursuit of pilchards; but becomes more rare towards the north. It is highly esteemed for the table, having among modern epicures much the same reputation which it had among those of ancient Rome. It is common in the Mediterranean. The Dory has a remarkable dark spot on each side. An idle legend refers these spots to the finger and thumb of St. Peter, and the Dory thus disputes with the haddock the honor of being reputed the fish from whose mouth he took the tribute-money. Other species of Dory, very similar to the European, are found in the seas of other parts of the world—one of them Australian, exhibiting similar dark spots.

DORYPHORA, n. *dōr-ĭf′ĕr-a* [Gr. *doruphoros*, bearing a spear—from *doru*, spear; *phoreo*, I bear, I carry]: in *entom.*, a genus of coleopterous insects (see COLORADO POTATO BEETLE); in *bot.*, a genus of *Atherospermaceæ*. *D. sassafras* is the sassafras tree of New South Wales; a genus of marine *Diatomaceæ*, having valves furnished with transverse or slightly radially-dotted lines.

DOSE, n. *dōs* [F. *dose*—from Gr. *dŏsis*, that which is given—from *didōmĭ*, I give]: the portion or quantity of medicine prescribed to be taken at one time; a portion; anything nauseous; what one is obliged to take: V. to give in portions or quantities, as medicine; to give anything nauseous, or to oblige to take. DO′SING, imp. DOSED, pp. *dōsd*. DOSOLOGY, n. [Gr. *logos*, a discourse]: in *med.*, a treatise on doses of medicine and their administration.

DOSEL, or DOSSELL: see DOSSER.

DOSITHEANS, *dō-sĭth′ē-anz:* sect of Samaritans founded by Dositheus, said by some authorities to have been a companion of Simon Magus in the 1st c. after Christ, and by others to have been a disciple of John the Baptist. He presented himself as the prophet promised in Deut. xviii. 18, which passage the Samaritans believed was the only true Messianic prophecy ever given; and laid great stress upon the prescripts of the law, especially concerning the Sabbath. The sect, never large in numbers, was in existence in the early part of the 6th century.

DOS PASSOS, JOHN R., American lawyer: b. Philadelphia 1844. He is of Portuguese descent. He studied law; served in the Federal army during the Civil War,

and after practising law in Philadelphia for some time went to New York in 1867, where he was very successful in the criminal branch of practice. Later he became an authority upon banking, corporate and financial law. He has written considerably. Among his published works are: *A Treatise on the Law of Stock Brokers and Stock Exchanges* (1882); *The Interstate Commerce Act* (1877); *Commercial Trusts; The Anglo-Saxon Century* (1903).

DOSS, n. *dŏs* [Flem, *dos*, dress array]: any ornamental knot, as a tuft of ribbons, flowers, hair, etc.: V. to make neat or spruce; to deck out: Adj. neat spruce. Dossie, n. *dŏs′sĭ*, a neat, small, well-dressed person: Adj. neat; spruce; active.

DOSS, n. *dŏs* [Icel. *dos*, a box]: a box or pouch for holding tobacco.

DOSS, n. *dŏs* [etym. doubtful]: a sleep; a bed.

DOSS, v.: to toss or attack with the horns; to pay down.

DOSS: see under Dossil.

DOSSER, n. *dŏs′sẽr* [F. *dossier*, back of a seat—from F. *dos;* L. *dorsum*, the back]: a pannier or basket to be carried on the shoulder: Adj. denoting the hangings placed at the back of the altar as a decoration, and to hide the bare walls; denoting hangings in a dining-hall behind the seats of the guests. Dorsale, n. *dŏr′sāl*, Dosel, n. *dŏs′ĕl*, or Dos′ser, n. *dŏs-sẽr*, a rich tapestry hanging at the back of an altar as an ornament, and to hide the wall; a hanging in a dining-hall; an ornamental cover for a chair; also Dos′sal, n. and Dossel, n.

DOSSIL, n. *dŏs′sĭl* [F. *dousil*, a peg or tap to draw off liquor from a cask—the primary idea being a bunch of something to stop an orifice: Ger. *docke*, a bunch, also the tap of a fish-pond: Gael. *dos*, a tuft, a cluster]: a small portion of lint made round, or in the form of a date, to be laid on a sore. Doss, n. *dŏs*, a cushion stuffed with straw to kneel upon; a hassock.

DOST, v. *dŭst:* 2d pres. sing. of the verb Do, which see.

DOT, n. *dŏt* [Dut. *dodde;* Low Ger. *dutte*, a plug or stopper: Gael. *dad*, a small point: Scot. *dottle*, a small particle: other modifications of Dot are *jot, tot, iōtă, tait*]: a small point or spot made with a pen, etc.; any small point or spot made with a pen, etc.; any small point or mark: V. to mark with small points. Dot′ting, imp. Dot′ted, pp. Dotting-pen, n. a pen having a roulette which makes dots or detached marks on the paper over which it is drawn.

DOT, n. *dŏt* [F. *dot*, a dowry—from L. *dōtem*]: in *familiar language*, a dowry; a dotation: see Dotation.

DOTAGE, DOTARD, DOTTARD, DOTTEREL, etc.: see Dote.

DOTATION, n. *dō-tā′shŭn* [F. *dotation*, an endowment —from L. *dotātiōnem*—from L. *dotātus*, endowed, portion—from *dos*, a dowry, a gift]: endowment; establish-

ment of funds for support, as of an hospital; a dowry or portion. Do′TAL, a. *-tăl*, pertaining to.

DOTCHIN, n. *dŏch′ĭn* [Chin.]: the Chinese steelyard. In Hong Kong and other parts where Europeans trade, the beams are doubly graduated with circles of brass pins to mark British and Chinese weights.

DOTE, v. *dōt* [Dut. *doten*, to be foolish, to rave; *dut*, sleep: F. *doter* for *radoter*, to dote, to rave: Icel. *dotta*, to nod the head in slumber]: to regard with excessive and foolish fondness; to show foolishness in the weakness of age. Do′TING, imp. Do′TED, pp.: ADJ. in *OE.*, stupid: see DOITED. Do′TER, n. one who, Do′TINGLY, ad. *-lĭ*. DOTAGE, n. *dō′tāj*, the childishness of age; feebleness of mind in old age. Do′TARD, n. *-tẽrd* a man in the childishness of age. Do′TARDLY, ad. *-lĭ*. DOTTARD, n. *dŏt′tẽrd* [Scot. *dottar*, to become stupid]: a standing tree in a state of decay. DOTTEREL, n. *dŏt′tẽr-ĕl*, or Dot′TREL, n. a kind of sandpiper proverbial for stupidity.

DOTH, v. *dŭth:* 3d pres. sing. pres. of Do. 1, which see.

DOTHIDEA, n. *dŏ-thĭd′ĕ-a* [Gr. *dothiēn*, a small abscess; *eidos*, form]: in *bot.*, genus of *Sphæriacei* (ascomycetous fungi), often growing upon leaves. They are distinguished from *Sphæria* and the more closely allied genera by the asci being contained in cavities in the stroma, without any distinct perithecium.

DOTIS, *dō′tĭsh*, or TOTIS, *tō′tĭsh:* town in the n.w. of Hungary, dist. of Komorn, 37 m. w.n.w. of Pesth. Between the town proper and its suburb, called *Lake Town*, from its situation on a small lake, are the remains of an old castle, said to have been a favorite residence of Mathias Corvinus, the Hungarian king. Dotis contains a splendid chateáu, the property of the Esterházy family, the gardens adjoining which are laid out in the English fashion. Pertaining to this castle are some very extensive wine-vaults, one containing a tun capable of holding 34,700 English gallons. Pop. (1900) 7,220.

DOTTEREL, *dŏt′tẽr-ĕl* (*Charadrius morinellus*): species of plover (q.v.), which in summer inhabits the n. parts of Europe and Asia, breeding chiefly in the highest latitudes, and migrates on the approach of winter to the countries around the Mediterranean and those of similar climate. It appears in Britain as a bird of passage, both on its northward migration in spring, and on its southward migration in autumn. Some breed in the mountains both of Scotland and of England, but only at considerable elevations. The Dotterel is about nine inches and a half in its whole length. In summer plumage, the upper parts are of a brownish ash color, the feathers edged with deep red; the cheeks throat, and a band above the eyes, white; the breast bright rust-color, with a white gorget on the upper part of it, bounded above by a blackish line; a conspicuous black patch on the middle of the belly; some of the tail feathers tipped with white. The Dotterel has become proverbial for stupidity; but the readiness with which it allows itself

to be approached seems entirely owing to its coming from regions little frequented by man, and it becomes shy and watchful after a little experience. It is much esteemed for the table, and well known in the London market.

DOTTLE, n. *dŏt′tl* [Eng. *dot*, and dim. suf. *le*]: a little particle; the refuse of a pipe of tobacco.

DOTTLE, v. *dŏt′tl:* to be in a state of dotage; to move in a hobbling manner: Adj. in a state of dotage or stupor; doting.

DOUANIER, n. *dô′ăn-ĭ-ā′* [F. *douanier*]: a French custom-house officer.

DOUAY, or Douai, n. *dô′ā* or *dow′ā:* town of France, department of Nord, on the river Scarpe, about 20 m. s. of Lille. Pop. (1901) 33,649. It is a dull, lifeless place, but surrounded with walls, and strongly fortified. The principal buildings are the churches, the Hotel de Ville, the public library, the museum, a hospital, and the old buildings of the English College. There are several good schools in Douay, and a great cannon-foundry. The manufactures include lace, tulle, cotton, oil, soap, brushes, iron machinery; and there is active trade in corn, seed, and linen. Douay has existed since Roman times. It was long a bone of contention between the Flemlish counts and the French rulers. It passed with the rest of Flanders under the dominion of Spain, but was taken by Louis XIV. 1667. Marlborough captured it in 1710, but the French re-occupied it after his withdrawal, and were finally confirmed in possession by the peace of Utrecht.—The *English Catholic College* at Douay, long the sole or chief theological seminary for English speaking Catholics, was founded by Dr. William (afterward Cardinal) Allen, 1568. By reason of political difficulties with the Spanish authorities, then in possession of the town, the college was transferred to Rheims 1578; but in 1593 it was again established at Douay, and there it flourished till the French Revolution, when it was broken up. Subsequently it was re-established on a smaller scale by the Benedictine Fathers, and is still conducted by them.

DOU-AY, *dôā′*, Felix Charles: 1816, Aug. 14—1879, May 4; b. Paris: French general. He entered the army as a private soldier when 15 years old, and was promoted sub-lieut. 1838, lieut. 1840, capt. 1843, lieut.col. 1853, col. 1856, gen. of brigade 1859, and gen. of division 1863. He served in the Crimean and Italian wars, was wounded at Solferino, commanded a brigade of the expeditionary corps sent to Mexico, and became aide de camp to Napoleon III, and commander of the 1st div. of inf. in the army. At the beginning of the Franco-Prussian war he was in command of the 7th corps. He was among the officers surrendered at Sedan. After the signing of peace he returned to France, placed himself at the service of M. Thiers just before the insurrection, 1871, Mar. 18, organized an army to operate against the insurgents in Paris, took an active part in the second siege of the city, and was

the first to enter it, May 21. He was appointed commander of the 6th corps 1873, and inspector gen. of the army 1879, Feb. Gen. Douay received all the decorations of the legion of honor.

DOUAY BIBLE: see BIBLE.

DOUB, PETER, D.D.: 1796, Mar. 12—1869, Aug. 24; b. N. C.: clergyman of the Meth. Episc. Church, South. He was received into the Va. conference 1818, and travelled extensively through Va. and N. C. Few men were more successful in swaying the minds of the community and in leading converts into the church than he. In 1866 he became prof. of Biblical literature in Trinity College, N. C., and held the office till death.

DOUBLE, a. *dŭb'l* [F. *double*, double—from L. *dūplus*, twice as much, double—from *dŭō*, two; *plĕō*, I fill]: twice as much; twofold; being in pairs; deceitful; acting two parts, that is, two lines of conduct, open and secret: V. to fold; to increase by adding an equal sum or quantity: N twice as much; a fold; the same quantity or length repeated; a turn in running; a trick: AD. twice over. DOUB'LING, imp.: N. a fold; an artifice; a shift; act of sailing round a cape; the winding and turning of an animal hunted. DOUBLED, pp. *dŭb'ld*. DOUBLENESS, n. *dŭb'l-nĕs*, state of being double. DOUB'LY, ad. *-lĭ*. DOUBLET, n. *dŭb'lĕt* [F. *doublet*]: two; a pair; a man's inner garment; a waistcoat; originally a close tight-fitting garment lined or wadded, in folds or doubles for defense, the skirts reaching a little below the girdle—almost identical with the jerkin: the sleeves were sometimes separate and tied on at the arm. Doublet is also a fraudulent imitation of a precious stone. DOUBLET, in *optics*, an arrangement of lenses in pairs, invented by Wollaston. It consists of two plano-convex lenses having their focal lengths in the proportion of one to three, or nearly so, and placed at a distance determinable by experiment. Doublet is also an old game bearing some resemblance to backgammon. DOUBLETTE, n. in *mus.*, a compound organ stop, consisting of two ranks, generally a twelfth and a fifteenth. DOUBLE-ACTING BALING-PRESS, one which has two boxes in which the material is compressed; sometimes a single follower acts upon them alternately, in other cases two followers act simultaneously. DOUBLE-ACTING ENGINE, an engine in which both motions of the piston are produced by the action of live steam, which bears upon the faces alternately. In contradistinction to single-acting, in which live steam is admitted to only one side of the piston, the weight of the pump rod or the pressure of the atmosphere giving the return motion. This form of engine was invented by Watt: see STEAM ENGINE. DOUBLE-ACTING INCLINED PLANE, inclined plane on which the loaded wagons, as they descend by their weight, pull up the empty wagons by means of a rope passing round a pulley or drum at the top of the inclined plane. DOUBLE-ACTING PUMP: see PUMP. DOUBLE-ACTION, n. in *mus.*, in a pianoforte movement, an arrange-

ment of a jointed upright piece at the back end of the key, used to lift the hammer instead of the stiff wire or lifter of the single action. The piece is called a hopper, and engages in a notch on the under side of the hammer to lift it, but, escaping or hopping therefrom, allows the hammer to fall away immediately from the string. DOUBLE-BACK-FALL, n. in *mus.*, an ornament in old music. DOUBLE-BANKED, or DOUBLE-BENCHED, a. *naut.*, applied to a boat which has two men to work the same oar, or has two opposite oars worked by rowers on the same bench. DOUBLE-BAR, n. in *mus.*, a sign formed of two single bars showing the end of a piece; the end of a movement of a work; the end of a portion to be repeated; the beginning of a change of key; or of a change of time; the end of a line of words set to music, as in a hymn tune. DOUBLE-BARRELLED, having two barrels—applied to a gun. DOUBLE-BASS, the lowest-toned musical instr. of the violin class. DOUBLE-BASSOON, n. in *mus.*, the deepest-toned instrument of the bassoon type; called also Contrafagotto. Its sounds are actually an octave below those written: see BASSOON. DOUBLE-BEAD, n. in *joinery*, two beads placed side by side and separated by a quirk. DOUBLE-BEARING, a. in *bot.*, producing twice in one season. DOUBLE-BEAT, n. an ornament of old music, consisting of a beat repeated. DOUBLE-BEAT VALVE a valve so arranged that, on opening, it presents two outlets for the water. The double-beat valve is used for deep wells and for high-lifts, such as the pumps of mines and water-works. DOUBLE-BITING, a. biting (cutting) with either edge; two-edged. DOUBLE-BITTED AX, n. an ax having two opposite bits or blades. It is an ancient form of battle-ax, being a favorite weapon with the Franks in the time of Clotaire (7th c.), and with the Danes in the time of Alfred the Great (9th c.). The double-bitted ax is found in the tumuli or barrows of N. America. DOUBLE-BLOCK, n. *naut.*, a block with two sheaves ordinarily placed in the same pin, but which rotate in separate interstices in the shell. Some double-blocks have the sheaves arranged one above the other. DOUBLE-BODIED MICROSCOPE, a microscope invented by Nachet, to enable several observers to view the same object simultaneously. DOUBLE-BOOK, n. book printed on half sheets. DOUBLE-BOURDON, n. in *mus.*, an organ-stop of 32 ft. tone. On the manuals it rarely goes below middle C; on the pedals it extends of course, through the whole compass. DOUBLE-BREASTED, a. applied to a coat or waistcoat either side of which may be lapped over or buttoned. DOUBLE-CAP, n. a flat (unfolded) writing or book paper, 17 × 27 inches. DOUBLE-CHANT, n. in *mus.*, a chant in two parts, each in two strains, the first of three and the second of four bars in length. DOUBLE-CHARGED, loaded with a double quantity of gunpowder. DOUBLE-CHISEL, n. a tool with two chisel-edges to cut the ends of a mortise simultaneously, while the chip extends into the depression between the bits. It is used in mortising sash-bars. DOUBLE-CHORUS, n. in *mus.*, a chorus for two separate

choirs; the several themes may be distinct, or so constructed that united they form one harmony. DOUBLE-CLASPING, a. fastened with a double clasp. DOUBLE-CLOTH LOOM, one for weaving two sets of webs simultaneously. These may be connected at certain parts, and cut apart subsequently, and so form a series of undergarments. In another form the two webs are so knitted as to form a tube, being joined by their edges. At certain intervals, both webs are thrown into one flat web of double thickness, and then again separated, forming a tube as before. The completed web is then cut apart mid-length of the doubled portion, and also mid-length of the tubular portion, and the result is a number of bags with closed bottoms. DOUBLE-COMPASS, n. an instrument whose legs are prolonged each way beyond the joint, so that either pair may be used; when the legs on one pair are double the length of the others, it answers as a bisecting-compass. DOUBLE-CONVEX LENS, a lens both sides of which are convex, though they may differ in the radii of their curves. When the difference is as 6 to 1, it is a crossed lens. DOUBLE-CORAL STITCH, in *needlework*, an embroidery stitch much used in ticking work, and for ornamenting linen DOUBLE-COUNTERPOINT, n. in *mus.*, a kind of artificial composition where the parts are inverted in such a manner that the uppermost becomes the lowermost, and *vice versa;* or, in other words, the art of making melodies grammatically convertible at certain intervals. DOUBLE-CROCHE, n. in *mus.*, a semiquaver. DOUBLE-CROWN, n. in *numis.*, an English gold coin, current in the early part of the 17th c. Its value was at first 10, afterward 11 shillings; in *print.*, a kind of paper, 20 × 30 inches, used for posters and bookwork. DOUBLE-CURVATURE, n. in *geom.*, a term applied to a line which curves in such a manner that not all parts of it are in the same plane. DOUBLE-CUT FILE, a file which has two rows of teeth, crossing each other at an angle, in distinction from the single-cut or float, which has but one row. DOUBLE-CYLINDER PRESS, in *print.*, a press with one form, and receiving paper from two cylinders. DOUBLE-CYLINDER PUMP: see PUMP. DOUBLE DAGGER, n. in *print.*, a reference mark next in order to the dagger; otherwise called a diesis. DOUBLE-DEALING, the profession of one thing and the practice of another; duplicity; deceit; dissimulation; fraud. DOUBLE-DEMISEMIQUAVER, n. in *mus.*, a note whose value is one-half of a demisemiquaver. DOUBLE-DEMY, n. in *print.*, a kind of paper, 35 × 22½ inches, used for posters and book-work. DOUBLE-DIAMONDS, n. a stitch made in Macramé lace. DOUBLE DIAPASON, n. in *mus.*, an organ stop of 16 ft. pitch. DOUBLE-DISTRESS, n. in *Scots law*, a name given to those arrestments which are used by two or more creditors, in order to attach the funds of their debtor in the hands of a third party. DOUBLE-D'OR, n. a French style of jewelry; a plate of gold is soldered upon one of copper, the respective thicknesses being one and eleven; the plate is then thinned by rolling, and worked

up into the required form. DOUBLE-DRAWING PEN, n. a draughtsman's pen to rule two lines at once. DOUBLE-DRILL, n. a drill with two cutters, making a countersunk hole so that the head of the screw or rivet placed therein shall not protrude. DOUBLE-DRUM, n. in *mus.*, a large drum beaten at both ends, in distinction from side, snare, and kettle drums. DOUBLE-DUTCH, n. gibberish; jargon, or some tonge not understood by the hearer. DOUBLE-DYED, *-dīd*, criminal in the highest degree; steeped in crime, as a double-dyed villain. DOUBLE-EAGLE, n. an American gold coin of the value of 20 dollars. DOUBLE-EDGED, that cuts either way, as a sword with two edges—that is, one having no back. DOUBLE-ELEPHANT, n. a size of drawing or flat writing paper, measuring 26 × 40 inches. DOUBLE-ENTRY, n. in *-bookkeeping*, a method of book-keeping in which every transaction is entered twice, on the creditor side of one account and on the debtor side of another, so as to serve as a check on each other. DOUBLE-FACED, showing two faces; deceitful. DOUBLE-FILE, n. a compound file made of two files riveted together, one edge projecting beyond that of the other. Used by cutlers and gun-makers in checkering their work, as on the small of the gun-stock. DOUBLE-FIRST, n. in *univ.*, one who takes his degree in the first class, both in classics and in mathematics. DOUBLE FLAGEOLET, in *mus.*, a flageolet having two tubes and one mouth piece, admitting of the performance of simple music in thirds and sixths, etc. DOUBLE-FLAT, n. a sign (bb) used in music before a note already flattened in the signature, which depresses the note before which it is placed another half tone. It is contradicted by a natural and a flat. DOUBLE-FLOWERS: see FLOWER.—DOUBLE-FLUID BATTERY, n. a galvanic battery in which two fluids are used as exciting liquids. They are kept apart by a porous cup, as in the Daniell's battery, or by gravity, as in Calland's. Daniell was the inventor of this form of battery, and received therefor the Copley medal of the Royal Soc. 1837. He used sulphuric acid in a porous cup placed in a glass cup containing sulphate of copper. DOUBLE-FRONTED, n. having two fronts; applied to a house, shop, etc., in which there are rooms and windows both sides of the entrance. DOUBLE-FUGUE, n. in *mus.*, a common term for a fugue on two subjects, in which the two start together. DOUBLE-FURROW PLOW, a plow striking two furrows at once; a gang or double plow. DOUBLE GEAR, n. the nests of variable speed gear-wheels in the headstock of a lathe; back-gear. DOUBLE-GEAR WHEEL, a wheel which has two sets of cogs of varying diameter; these may drive two pinions, or be driven by one and drive the other. DOUBLE-GLOUCESTER, n. a superior kind of rich cheese, of double thickness, manufactured in Gloucestershire, England. DOUBLE-HALF-ROUND FILE, same as cross-file. DOUBLE-HAMMER, n. in *metal.*, forging device for operating upon a bloom or puddler's ball, striking it upon opposite sides simultaneously. DOUBLE-HANDED, a *lit.*, having two hands: *fig.*

double-dealing; treacherous; deceitful. DOUBLE-HEADED, a.. having two heads; in *bot.*, having the flowers growing one to another. DOUBLE-HEADED SHOT, in *ord.*, a projectile formerly used, consisting of two shot united at their bases. DOUBLE-HEADED WRENCH, a wrench having a pair of jaws at each end, one diagonal, the other right-angular. DOUBLE-HUNG, n. in *carp.*, a term applied to the sashes of a window when movable, the one upward and the other downward, by means of cords, weights, and pulleys. DOUBLE-IMAGE MICROMETER, suggested by Roemer about 1678; brought into use by Bonguer about 1748; a heliometer. DOUBLE-IMPERIAL, n. in *print.*, a kind of paper, 32 × 44 inches. DOUBLE-INSURANCE, n. in *law, com.*, etc., the term applied when a person, being fully insured by one policy, effects another insurance on the same property with another office. In this case the law will allow him to be indemnified from one insurance or the other, but not to make a profit by claiming indemnification from both. DOUBLE-JOINTED COMPASS, a compass having, in addition to the main joint, additional joints by which legs may be bent to secure a proper presentation of the feet to the paper. DOUBLE-KNIFE, n. a knife having a pair of blades which may be set at any regulated distance from each other, so as to obtain thin sections of soft bodies. One form of this is known as Valentin's knife, from the inventor. DOUBLE-KNITTING, n. in *needlework*, a stitch in knitting which, producing a double instead of a single web, is especially useful when light and yet warm articles are to be knitted. DOUBLE-KNOTS, n. in *needlework*, a knot used in tatted crochet. DOUBLE-LEAF, n. in *bot.*, *Listera ovata*, from its two opposite and only leaves. DOUBLE-LETTER, n. in *print.*, two letters on one shank, as *ff*, *fl*. DOUBLE-LIGHT, n. a variety of light as displayed for the warning and instruction of mariners from lighthouses. The light indicates land, rock, or shoal, and, by varying the characteristics of the light, the seaman is informed of the part of the coast he is on, and of his bearings as to his port or course. The other characters of light are known as Fixed, Revolving, Intermittent, Flashing, and Colored. These are variously combined. The double-light is usually exhibited from two towers, one of which is ordinarily higher than the other. DOUBLE-LINE, n. a form of driving-lines or reins in which supplementary reins are afforded, which may be brought into use in emergency, such as an attempt to bolt. In some cases it is an extra rein to pull the horses' heads together; a rein to pull a hood over the eyes of a horse; a gag-rein to pull the bit violently into the corners of his mouth; a choking-rein around the throat; a gripper on the muzzle; shutters on the nostrils, etc. A description of driving-reins or lines in which each main branch has a check-line to the bit of the other horse. DOUBLE-LOCK, n. a canal-lock having two parallel chambers connecting by a sluice. Each chamber has a gate at each end connecting with the upper and lower pounds respectively. The object is to save one-half the water that

would be used in locking boats: V. to fasten a door by shooting the lock twice; to fasten with double or extra security and caution. DOUBLE-LONG, a. in *needlework*, a stitch used in crochet. DOUBLE-MARGIN DOOR, in *joinery*, a door framed in imitation of folding-doors, the central style being made double with an intervening bead. DOUBLE-MEDIUM, n. in *print.*, a kind of paper, 24 × 38 inches. DOUBLE-MILLED, a. in *cloth manufac.*, twice milled or fulled, to render more compact and fine. DOUBLE-MINDED, unstable; unsettled; wavering. DOUBLE-MOLDBOARD PLOW, in *agri.*, a plow having a moldboard on each side of the sheath, so as to throw the soil away right and left. It is used in hilling up crops, such as potatoes and cabbages, but not used for corn, the rows being too wide apart. DOUBLE-OCTAVE, n. in *mus.*, the interval of a fifteenth. DOUBLE PEDAL POINT, n. in *mus.*, a portion of a fugue or melody in which two notes are long sustained, commonly the tonic and dominant. DOUBLE-PICA, n. in *print.*, a size of type double the size of small pica. DOUBLE-PILED FABRIC-LOOM, one in which a pile is formed on both sides of the foundation, and which may be produced from either the warp or the weft. DOUBLE-PISTON PUMP, one which works two pistons from a single lever or handle. It may be double or single acting as to the separate pistons. DOUBLE-PISTON ROD ENGINE, a direct-action steam-engine; said to afford the shallowest arrangement yet known, with no beam above deck, and is used on the Rhone, the Indus, and the Sutlej. DOUBLE-PLANE-IRON, n. in *carp.*, a smoothing-plane iron having a counter-iron to bend up the shaving in working cross-grained stuff. DOUBLE-PLEA, n. in *law*, a plea in which the defendant alleges for himself two several matters in bar of the action, whereof either is sufficient to effect his desire in debarring the plaintiff. DOUBLE-QUARREL, or DOUBLE COMPLAINT, n. *eccl. law*, a complaint made by any clerk or other to the archbishop of the province, against an inferior ordinary, for delaying justice in some cause ecclesiastical. And this seems to be termed a double-quarrel probably because the complaint is commonly made against both the judge and him at whose petition justice is delayed. DOUBLE-QUICK, n. in *milit.*, 165 steps of 33 inches each to be taken in one minute. If necessity requires, the steps may be increased to 180. It is, next to the run, the fastest time in marching. DOUBLE-REED, n. in *mus.*, the vibrating reed of instruments of the oboe class; a reed stop on an organ of 16-ft. pitch. DOUBLE-RELISH, n. in *mus.*, an ornament in old music. DOUBLE-ROYAL, n. in *print.*, a kind of paper, 26 by 40 inches. DOUBLE-SALT, n. in *chem.*, a compound salt, consisting of two salts in chemical combination, as common alum, which contains sulphate of alumina and sulphate of potash. DOUBLE-SAW, n. a stock having two blades at a regulated distance, adapted to cut kerfs and space the intervals, as in comb cutting. DOUBLE-SEAMING MACHINE, a tool or machine for lapping the edges of

sheet-metal one over the other, and then doubling over the lapped portions so as prevent the portions slipping apart. DOUBLE-SEAT VALVE, perhaps another and more appropriate term for the double-beat-valve. DOUBLE-SHARP, n. in *mus.*, a sign (Œ) used before a note already sharp to indicate that it is desired to raise the pitch by a semitone. It is contradicted by a natural and a sharp. DOUBLE-SHOTTED, loaded with a double quantity of shot, augmenting the destructive power of ordnance. DOUBLE-SHOVEL PLOW, a plow for tending crops, having two small shovels on as many sheths. They are arranged a little distance apart, and one a little behind the other. The lefthand plow is a little in the rear when the right is specially engaged in working the crop. DOUBLE-SHUFFLE, n. a low dance. DOUBLE SPEED PULLEY, n. a contrivance for giving what is termed double speed to the spindles of the self-acting mule. DOUBLE-SQUARE, n. in *needlework*, an embroidery stitch, also known as queen stitch. DOUBLE-STARS, n. in *astron.*, two stars so close to each other as to appear one to the naked eye. DOUBLE-STOPPING, n. in *mus.*, the stopping of two strings simultaneously with the fingers in violin playing. The practice was first suggested by John Francis Henry Biber in 1681, in a set of solos for a violin and a bass; one of these pieces is written in three staves, two for the violin playing in double stopping, and the third for the bass. He also in the same work suggests a varied tuning in fourths and fifths for the purpose of making the double-stopping easy. DOUBLE SUPER-ROYAL, in *print.*, a kind of paper, 27 × 42 inches. DOUBLE-TANG FILE, a file with a tang at each end, to adapt it to receive the handles. DOUBLE-TONGUE, v. in *bot.*, the plant horse-tongue. DOUBLE-TONGUED, a. self-contradictory in speech at different times; deceitful. DOUBLE-TONGUING, n. in *mus.*, a peculiar action of the tongue against the roof of the mouth, used by flute players, to insure a brilliant and spirited articulation of staccato notes. The term is sometimes applied also to the rapid repetition of notes in trumpet and cornet playing. DOUBLE TRAVALE, n. in *mus.*, a direction in tambourine playing. DOUBLE-TREE, n. the bar which is pivoted to the tongue of a carriage, wagon, or sled, or to the clevis of a plow or other implement. DOUBLE-TRUMPET, n. in *mus.*, an organ reed stop, similar in tone and scale to, but an octave lower in pitch than, the 8 ft. trumpet. DOUBLE-VAULT, n. in *arch.*, one vault built over another with a space intervening. Double-vaults are used in domes and domical roofs, the interior dome being of less altitude in order to harmonize with the proportions of the building internally. DOUBLE-WARP, n. in *fabrics*, a cotton cloth in which the warp and weft are of uniform size. DOUBLE WATER-WHEEL, an arrangement of two water-wheels on one shaft, as in the case of a double-headed turbine, which has a wheel at each end of a horizontal shaft. DOUBLE X or XX, n. name given to porter or beer of more than ordinary strength; according to Palmer, a survival, in a somewhat disguised form, of the

L. word *duplex* (misunderstood as double X). Thus, the fellows and postmasters of Merton College were forbidden by the statutes to drink *cerevisium duplex* or strong ale. DOUBLER, n. in *elect.*, instrument to increase the least conceivable quantity of electricity by continually doubling it, until it becomes perceptible upon a common electrometer or is made visible in sparks. It was invented by Bennet, improved by Darwin, and afterward by Nicholson: in *distill.*, a part of the still apparatus, or an appendage to a still in which the low wines, one of the products of the first distillation, are re-distilled. A part of the still is arranged to condense and then intercept and return the less volatile vapors, while those of greater tenuity pass on: in *manuf.*, a machine in which slivers, stricks, or filaments of wool, cotton, flax, or silk are laid together, to be drawn out and again doubled and drawn to remove inequalities, or, in the case of silk, to increase the thickness of the strand: in *calico print.*, a blanket or felt placed between the cloth to be printed and the printing-table or cylinder; a large dish or charger. TO DOUBLE A CAPE, to sail round it. DOUBLE OR QUITS, in *betting or gambling*, when a winner lays down his stake, the loser promising to pay twice his stake if he loses again; if the loser wins the second throw he pays nothing—thus neither player loses or wins anything. DOUBLING, n. in *build.*, the double course of shingles or slates at the eaves of a house; in *distill.*, the second distillation of low wines. These are the product of the first distillation, and they contain about one-fifth alcohol; in *cloth manuf.*, bringing two or more slivers of fibre together and forming them into one of greater thickness, to be again reduced by drawing, thus obtaining a sliver of uniform thickness: in *milit.*, the uniting of two ranks or files into one; the act of marching at the double; *naut.*, the act of passing or sailing round a headland; of *the bitts*, a piece of fir timber fitted on the back of the cross-piece; fir lining; of *a sail*, the double-seamed border for receiving the bolt-rope; the edgeing or skirt; in *ship-build.*, strakes of plank fastened on the outer skin of a ship; used as a fender against floating ice. DOUBLING AND TWISTING MACHINE, one by which a number of slivers of fibre are associated, drawn out, and partially twisted; or one in which strands are laid together and twisted into a thread or cord. DOUBLING-FRAME, n. in *silk manuf.*, a winding engine for double silk, threads. DOUBLING-NAIL, n. a nail used in securing sheathing, lining, or supplementary covering to an object, such as the lining of gunports.

DOUBLE ASPECT THEORY, in philosophy: see METAPHYSICS.

DOUBLE AVAIL OF MARRIAGE, in Scots Law: an old feudal custom which gradually acquired the force of law, by which a lord or other superior exacted from a vassal's son, unmarried at the time of his father's death, and who afterward married, not only the dower of the lady, which was called *single avail*, but considered himself entitled to choose a wife for the young man, and take from

him *double avail*, or double dower, if he rejected the person chosen for him and married another.

DOUBLE CONSCIOUSNESS (or divided consciousness), likewise designated double personality or alternative of personality: term comprehending a group of morbid mental conditions involving some modification in the clearness of the idea of personal identity. Persons are sometimes observed to have confused notions of the 'me' and 'not me;' others conceive that parts or properties of their frame belong to another person, or that they are inhabited and ruled by a spirit or entity acting in opposition to their will and interests; and there are others who in certain circumstances, such as when influenced by, or free from moral or physical stimulation, conceive that they are different persons, and endowed with different qualities and powers. These manifestations, however, do not fully illustrate the state under consideration, which has been described as exhibiting, in some measure, two separate and independent trains of thought, and two independent mental capabilities in the same individual, each train of thought and each capability being wholly dissevered from the other, and the two states in which they respectively predominate, subject to frequent interchanges and alternations. In the most marked or perfect form of this phenomenon, the individual is conscious of the two independent trains of thought, and conceives, in consequence of the apparent independence of these, that he is two distinct persons at the same time. There are several instances of this mental affection on record (see Wigan *On Duality of Mind*, Abercrombie's *Inquiry into Intellectual Powers*, Ellicot in Combe's *System of Phrenology*, 3d ed.) In some cases there are three or more different personalities. Sometimes a person in one state has a recollection of what was done in the other state. Sometimes it is as if there were two absolute distinct individuals alternately possessing and using the same brain and body, the doings of one individual being unknown and unremembered by the other individual. Each personality therefore leads a life of alternate consciousness and unconsciousness.

DOUBLEDAY, *dŭb'l'dā*, ABNER: b. Ballston Spa, N. Y. 1819, June 26—1893, Jan. 26; officer U. S. A. He studied civil engineering and practiced it 1836-38, entered the U. S. Milit. Acad. the latter year, graduated and was assigned to the 3d. artil. 1842. He served through the Mexican war and Seminole campaign, 1856-58; was in command of the forts and batteries on the Potomac, 1861; commanded all defenses of the national capital, 1862. He took part in the second battle of Bull Run as commander of a div.; took six battle-flags at Antietam; and, after serving at Fredericksburg and Chancellorsville, succeeded to the command of the 1st corps. At Gettysburg he supported Gen. Buford's cav., and commanded the field after Gen. Reynold's death till Gen. Howard's arrival. When the Confederates under Gen. Early threatened Washington, 1864, July, Gen. Doubleday was recalled to its

defense. In 1865, Mar., he was brevetted col. U. S. A., and brig. gen. and maj. gen. for his distinguished services during the war. In 1873 he retired from active service.

DOUBLEDAY, Neltje Blanchan, American author: b. Chicago, 23 Oct., 1865. She was married to F. N. Doubleday in 1886. She has published: *The Piegan Indians* (1894); *Bird Neighbors* (1897); *Birds that Hunt and are Hunted* (1898); *Nature's Garden: Our Wild Flowers and Their Inseet Visitors* (1900); *How to Attraet the Birds* (1902).

DOUBLEDAY, Russel, American author: b. Brooklyn, 26 May, 1872. He was educated in private schools, and served in the United States navy during the Spanish-American war, 1898. He has written: *A Gunner Aboard the Yankee*; *Cattle Raneh to College; A Year in a Yawl* (1901); *Stories of Inventors* (1904).

DOUBLE FLAT: musical character used to lower the note before which it is placed two half-tones.

DOUBLE PERSONALITY: see Multiple Personality.

DOUBLE IMAGES: the two uncombined impressions from a single object which may be perceived in visual experience when objects lie nearer than the point of fixation or further away. Double images also appear in abnormal cases through incoördination of the two eyes, as for example, in squinting or in incoördination due to intoxication. Technically explained, these images arise because of the distribution of light from a given point upon non-corresponding points of the retinas. See Corresponding Points.

DOUBLE SHARP: musical character, the reverse of the double flat.

DOUBLE STARS, or Binary Stars: see Stars.

DOUB'LINGS: heraldic term for the linings of robes or mantles, or of the mantlings of achievements: see Mantling.

DOUB'LING THE CUBE: celebrated geometrical problem among the ancients. The object was, to find the side of a cube whose content should be twice that of another given cube; and various accounts are given of how the problem was suggested. One legend brings the matter into connection with Delos (hence the name of 'the Delian problem'), and relates that the oracle of Apollo in that island, being consulted by the inhabitants during the prevalence of a pestilence, gave for answer, that they should make the altar of Apollo, which was in the form of a cube as large again. This was done, and yet the pestilence continued; and the oracle being again consulted, replied, that the altar must retain its cubic form, which had not been attended to in the enlargement. This problem perplexed the Delians, as it did mathematicians of after ages. Even Plato, whom they consulted on the difficulty, could give them no solution, and had recourse, according to the story, to evasion.

The problem, however, is older than Plato; before his time, it had occupied Hippocrates of Chios (not the physician Hippocrates), and was studied afterward by Eratosthenes, Nicomedes, Hero, and others. Apollonius applied conic sections to the solution of the question, as did also Menæchmus; Nicomedes invented a curve, which he called the conchoid, for the express purpose, and Diocles the cissoid. The analytical method introduced into geometry by Descartes showed this problem in its true light. It was seen to be only a special case of the solution of a cubic equation—a solution impossible by geometry, i. e., by the use of the circle and straight line. It may, however, be represented by the intersection of two conic sections, of which one may be a circle. Descartes made use of the parabola with the circle, which is the simplest way. With numbers, the question is merely one of the extraction of the cube root. If the side of a cube be one foot, its solid content is $1 \times 1 \times 1 = 1$ cubic foot. The side of a cube of double that content, or 2 cubic feet is $\sqrt[3]{2} = 1.259921$.

DOUBLOON, n. *dŭb-lôn′* [F. *doublon*—from Sp. *doblon* (see DOUBLE)]: gold piece coined in Spain and Spanish America; used also in Portugal; the double of the pistole. The Dublon de Isabella, coined since 1848, is of 100 reals, and equivalent to 25.84 French francs, or 20*s.* 8*d.*; abt. $5.00. The older Spanish doubloons vary in value from 85 to 81 francs.

DOUBS, *dô:* dept. of France, on the e. frontier, separated from Switzerland by the Jura Mountains, lat. 46° 35′–47° 31′ n., long. 5° 42′–7° 4′ e.; 2,018 sq. m. Doubs is traversed by the river Doubs, a tributary of the Saone, and is separated, on the n.w., from the dept. of Haute Saone by the Oignon, also a tributary of the Saone. The surface is hilly, being crossed by four parallel ranges of the Jura Mountains. The climate is more rigorous than in most similar latitudes. The pine and the walnut attain a huge size, and the common orchard trees thrive well. Maize, potatoes, hemp, and flax are raised. The pasturage is excellent, and rears good breeds of horned cattle and horses, which are exported. In the valleys, great quantities of butter and cheese are produced. The rivers are well stored with fish. Mines of iron and coal are worked, and gypsum and marble are abundant. The trade is principally in iron, cattle, horses, and dairy produce. Doubs is divided into the four arrondissements, Besançon, Baume-les-Dames, Montbelliard, and Pontarlier. Cap. Besançon. Pop. (1901) 298,864.

DOUBT, n. *dowt* [F. *douter;* prov. F. *dubtar*, to doubt —from L. *dubĭtārĕ*, to waver, to fear—from L. *dubĭŭs*, doubtful, what may turn out in two ways]: uncertainty of mind; suspense; suspicion; fear; apprehension: V. to hesitate; to waver in opinion; to suspect; to fear; to hesitate to believe; to be in a state of uncertainty of mind: DOUBT′-ING, imp., N. scruple; perplexity. DOUBT′ED, pp.

DOUBT'ER, n. one who. DOUBT'FUL, a. *-fûl,* uncertain; obscure; not clear or obvious; undetermined; suspicious. DOUBT'FULLY, ad. *-lĭ.* DOUBT'FULNESS, n. in a state of suspense or uncertainty. DOUBT'INGLY, ad. *-lĭ.* DOUBT'LESS, ad. *-lĕs,* without doubt; unquestionably. ADJ. free from fear. DOUBT'LESSLY, ad. *-lĭ,* unquestionably.—SYN. of 'doubt, v.': to scruple; waver; fluctuate; demur; question; suspect; dissent; apprehend;—of 'doubtful': dubious; wavering; hesitating; undetermined; equivocal; ambiguous; questionable; hazardous; distrustful; problematical; precarious.

DOUBT in philosophy: see BELIEF.

DOUBTING MANIA: a form of besetting impulses (sometimes known as manias) of morbid character. Its characteristic is an insistent rumination and speculation, the over-emphasis of the thought process leading to senseless precautions and restraint from action. The subject often maintains a patient struggle against his morbid tendencies and admits their unreasonable character. The essence of the difficulty lies in a morbid self-consciousness which (notably in hysteria) takes on protean forms. The patient reflects upon trifling subleties, and inconsequential and imaginary obstacles to free action. He may doubt his own reality, the objectivity of the situations he has to meet, the worth or value of acting at all. He speculates as to the precise nature of his routine duties, broods upon past errors, vacillates, and ruminates, anticipates improbable interferences, and is again and again beset by impulses to abandon a plan as soon as determined upon. All this harasses the mind and prevents action, the latter trait bringing the disorder into the field of the will. It is an impairment of impulse through excess of consciousness. The state occurs both in connection with functional troubles (neurasthenia) and in more organically determined mental disorders (melancholia). Slight tendencies toward this sort of difficulty are very common among normal persons, especially at susceptible periods of development.

DOUGALL, LILY A. Canadian novelist: b. Montreal, Canada, 1858, April 16. Spent her childhood and some later years in New York; has travelled much and lived in England and Scotland. Her works include: *Beggars All* (1891); *What Necessity Knows* (1893); *The Mermaid; A Love Tale* (1895;) *The Zeitgeist* (1895); *The Question of Faith* (1895); *The Madonna of a Day* (1896); *A Dozen Ways of Love* (1897); *The Mormon Prophet* (1898); *The Earthly Purgatory* (1904).

DOUGH, n. *dō* [AS. *dah;* Icel. *deig,* properly damped flour, dough; *deigia,* to wet; O.H.G. *daha,* clay: Goth. *deigan,* to mold in plastic materials]: a soft, moistened mass of flour and yeast kneaded; bread before being baked in an oven (see BREAD). DOUGHY, a. *dō'ĭ,* soft like dough. DOUGH-FACED, weakly and sickly looking; cowardly. DOUGH-NUT, a small cake boiled in lard. MY CAKE IS DOUGH, my undertaking has proved unsuccessful.

DOUGHTY, Arthur George: b. England, 1860; was educated in London and at New Inn Hall, Oxford, and graduated in 1880; came to Montreal 1886 and devoted himself to literary work, at first poetry and then to the early annals of Quebec; became private secretary to members of Quebec Government 1897-9 and joint librarian of Quebec Legislature 1901-4; appointed Dominion archivist at Ottawa 1904 and created C. M. G. 1905. Among his works are; *Life and Works of Tennyson* (1893); *Rose Leaves* (1894); *The Song Story of Francesca and Beatrice* (1896); *Nugæ Canoræ* (1897); *The Siege of Quebec and the Battle of the Plains of Abraham* (6 Vols. assisted by Dr. Parmalee, 1901-2); *Quebec under Two Flags* (1903); *The Fortress of Quebec* 1608-1903, (1904).

DOUGHTY, a. *dow'tĭ* [AS. *dohtig*, valiant: Dut. *deugen*, to be of some value: Goth. *dugan*, to avail: Ger. *taugen*, to be good for]: brave; valiant; noble; often used banteringly. Dough'tiness, n. *-nĕs*, valor; bravery. Dough'tily, ad. *-lĕ*.

DOUG'LAS: modern capital and principal seaport of the Isle of Man, in the Irish Sea; so called from being near the junction of two streams—the *Dhoo* (black) and *Glass* (gray). Douglas lies on the margin of a highly picturesque bay, on the e. side of the island. From the excellence of the sea-bathing, and its central position, it has become highly popular as a watering-place. The old town, on the s.w. edge of the bay, consists of narrow tortuous streets, and presents a vivid contrast to the handsome modern terraces and villas which occupy the rising ground beyond. Douglas has an excellent landing pier; another pier and breakwater, constructed of concrete cement blocks, was opened 1879; the new street and charming promenade following the line of the bay is one of its most agreeable features. Conspicuous in the centre of the crescent of the bay stands Castle Mona, formerly the residence of John, Duke of Athol, now a first-class hotel. The Tower of Refuge, a picturesque object, occupies a dangerous rock, in the southern area of the bay, called Conister, and was erected 1833 for the safety of shipwrecked mariners, by the late Sir William Hillary, Bart., who, during his residence at Douglas, founded the Royal National Life-boat Institution. Douglas, is the principal packet station of the island, with a daily service of steamers during the summer months, and has telegraphic communication with England. Pop. (1901) 19,126.

DOUGLAS, Alice May, American writer for young people: b. Bath, Maine, 1865, June 28. Her writings include in verse: *Phlox; May Flowers; Gems Without Polish;* in prose: *Jewel Gatherers; The Peacemaker;* and *Self-Exiled from Russia*, etc.

DOUGLAS, Amanda Minnie, American author: b. in New York 1837, July 14. She has written about 30 novels besides doing other literary work. Among her novels are: *In Trust; Claudia; Stephen Dane; From Hand to Mouth; Out of the Wreck; A Woman's Inheritance; Osborne of*

Arrochar (1883): *Her Place in the World* (1894). She has also written several juvenile tales, also the "Little Girl" Series, (1902) giving views of a girl on New Orleans and other cities, and the 'Helen Grant' Series.

DOUGLAS, Family of: ancient Scottish family, prominent in Scottish history through nearly seven centuries. Titles and distinctions were liberally bestowed on the Douglases by ruling monarchs during that period. Bravery was a distinguishing trait of the family at all times. Sir James (1286–1330), fell in battle during the Crusades, at Andalusia; his son, William, was slain at Halidon Hill; James, son of the first earl, died at Otterburn and Archibald, fourth earl yielded up his life at Verneuil. The sixth earl, William, was executed by conspirators. The eighth earl was stabbed to death, by James II of Scotland during a quarrel. His successor to the title, the fifth earl of Angus was publicly hanged at Lernd Bridge in 1482. After many family vicissitudes a dukedom of Douglas was created in 1703. The first duke died without issue. The title then passed to the Duke of Hamilton. In 1769 the Douglas title was revived, after lengthy litigation. The successful claimant was raised to the peerage in 1790 as Baron Douglas of Douglas. In the fourth generation, with the death of the fourth Lord Douglas in 1857, the title again became extinct.

DOUG'LAS, General Sir Howard, Bart., G.C.B. 1776–1861. Nov.; b. Gosport, England; son of Admiral Sir C. Douglas. Entering the army when young, he served in Spain and Portugal 1808–9, and again in Spain 1811–12. He was gov. of New Brunswick 1823–29, Lord High Commissioner of the Ionian Islands 1835–40, and M.P. for Liverpool 1842–47. In 1851, he became a gen. in the army, and col. of the 15th regt. foot. He wrote several treatises, among which are *An Essay on the Principles and Construction of Military Bridges, and the Passage of Rivers in Military Operations* (Lond. 1816), a treatise on *Naval Gunnery* (1819; 4th edit., 1855); *Observations on Carnot's Fortification*, etc. His treatise on *Naval Gunnery* is regarded as a standard authority in foreign countries, though his recommendations were not acted upon by the British Admiralty until 13 years after the publication of his work. He censured the conduct of the war in the Crimea in 1855, and declared that Sebastopol could not be reduced unless by a change in the plan of operations, such as he traced. His prophecy was verified by the event. He also published *Considerations on the Value and Importance of the British and North American Provinces*, and a treatise entitled *Naval Evolutions*.

DOUGLAS, Stephen Arnold: 1813, Apr. 23—1861, June 3; b. Brandon, Vt.: statesman. He worked on a farm till 15 years old, then with a cabinet maker 18 months, and afterward spent a year at Brandon Acad., and on the re-marriage of his mother and her removal to Canandaigua,

N. Y., took the academic course at the acad. there. He then began studying law, but unwilling to be a burden upon his mother during the necessary course, went to Ill. 1833, with the intention of supporting himself by teaching. At Winchester he earned his first wages by acting as clerk to an auctioneer, and with a capital of $6 opened a private school. He obtained 40 pupils, taught them in the daytime, read law at night, and practiced before the police justice in small cases on Saturdays. In 1834, Mar., he was admitted to the bar in Jacksonville, Ill., and established an office there. Within a month he entered upon his political career by defending President Jackson's administration in a democratic mass meeting, where he made such a favorable impression that a large amount of collection business began pouring into his office from total strangers, and he was elected attorney-gen. of the state by the legislature, though not yet 22 years old. In 1835 he resigned this office on being elected to the legislature; 1841 was chosen a judge of the supreme court of the state; 1843, '44, '46, was elected a member of congress as a democrat; and 1847 became U. S. senator. In the early part of his congressional career he took high rank on all questions of constitutional law, and made himself an acknowledged power in the deliberations of the house. Subsequently his voice was heard, and his influence felt on all important matters of legislation and national concern. During the Oregon controversy he declared that the United States had a clear and unquestionable title to the whole of that territory up to lat. 54° 40′ n., and urged the termination of the joint occupation, the establishment of a territorial govt., and the preparation of the country for war in case the assertion of our national rights led to complications with Great Britain. He made a great defense of Gen. Jackson's conduct in New Orleans, when advocating the bill to refund the $1,000 fine imposed upon him by Judge Hall, and was one of the most active advocates of the admission of Tex. as a state into the Union. In 1846 he was chairman of the committee on territories, and reported the joint resolution by which Tex. was declared to be one of the United States. In the long and acrimonious debate upon this measure, he maintained its constitutionality in a powerful speech; he did not believe that congress had a right to impose an anti-slavery restriction upon any of the territories or states of the Union, but was willing that the principle of a division of the public domain between the two sections of the country as tendered by the north and accepted by the south 1820, which had been established to cover the acquisition of La., should be extended to Tex. In 1846, he opposed David Wilmot's 'proviso' for the restriction of slavery to any new territory that might be acquired from Mexico by treaty of peace, and 1848, endeavored to have slavery prohibited in all the territory n. of the parallel of 36° 30′ by offering an amendment to the Oregon bill extending the Mo. compromise line to the Pacific Ocean. The senate adopted the amendment,

the house rejected it, and from these actions arose the great sectional agitation, which the 'compromise measures of 1850' partially allayed. In 1852 he was re-elected U. S. senator, and his name was presented to the democratic convention in Baltimore as a candidate for the presidency. In 1853, Dec., he reported the bill for the organizations of govts. in the territories of Kan. and Neb. and the whole subject of slavery in the new territories was renewed. Under his lead, however, the bill was carried through both branches of congress, and constitutes what is known as the 'territorial legislation of 1854.' In 1856 his name was again presented to the democratic convention for the presidential nomination, but, opposing the principle of the two-thirds rule, he withdrew, and James Buchanan was nominated. In 1858 he was a second time re-elected U. S. senator, after a memorable canvass, distinguished by his joint discussions with Abraham Lincoln. In that year, and again 1860, he made a tour of the southern states, and everywhere denied the right of secession; and as a member of the 'committee of thirteen' and on the floor of the senate exerted all his great powers and influence to avert civil war. He received the nomination for pres. by the adjourned democratic convention at Baltimore 1860, was opposed by a large number of his former political associates on account of what was called his 'squatter-sovereignty' doctrine, which left the territories open to the introduction of slavery; and in the election received a popular vote of 1,365,976 and an electoral vote of 12. After hostilities opened he gave a giant's support to President Lincoln and the Union cause, till stricken with his fatal illness, and even then dictated a death-bed message to all his political friends and opponents to unite in support of the govt., to obey the laws, and uphold the constitution. At the time of his death he had served in the U. S. senate 14 years, and been chairman of the committee on territories (then the most important one) in the house two years and in the senate 11 years. The bills for organizing the territories of Minn., Or., N. Mex., Utah, Wash., Kan., and Neb., and for the admission of the states of Io., Wis., Cal., Minn., and Or., were reported and carried through by him. He was married twice, and his eldest son, Robert M.D. Douglas, was President Grant's private sec. for a time.

DOUGLASS, *dŭg'las*, David Bates, ll.d.: 1790, Mar. 21—1849, Oct. 19; b. Pompton, N. J.: engineer. He graduated at Yale College 1813; was immediately appointed 2d lieut. corps of engineers, u. s. a., and placed in command of the sappers and miners at the U. S. Milit. Acad.; participated in the battles of Niagara and Lundy's Lane, and was promoted 1st lieut. and brevetted capt. for gallantry in repairing Fort Erie under the enemy's fire; was appointed asst. prof. of nat. and experimental philos. at the U. S. Milit. Acad. 1819, and of civil and milit. engineering 1823; and resigned from the army 1831. He then accepted the appointment of chief engineer of the Morris Canal Company (N. J.), and introduced the system of

inclined planes instead of locks in the construction of that work. On the completion of the canal, 1832, he was appointed prof. of nat. philos. and civil engineering in the Univ. of New York; resigned 1833; surveyed the Brooklyn and Jamaica railroad on Long Island; and made the surveys, plans, and estimates for supplying the city of New York with water from the Croton river 1833–35, and was chief engineer of the work till 1836, Oct. He then planned and laid out Greenwood Cemetery, Brooklyn, 1838–41; was pres. of Kenyon College, O., 1841–44; planned and laid out the cemeteries in Albany and Quebec; designed the supporting wall for the Brooklyn Heights and the water-works system of that city; and was appointed prof. of mathematics at Hobart College, N. Y., 1848. His remains were buried in Greenwood cemetery at the request and expense of the board of directors.

DOUG'LASS, Frederick, b. Tuckahoe, near Easton, Md., 1818, Feb.; d. 1895, Feb. 20; orator; son of a white father and a negro slave mother. He was reared a slave on the plantation of the Auld family under the name of Frederick Bailey till he was ten years old, when his master allowed him to hire his own time and sent him to live with a relative in Baltimore. There he learned to read and write, and found employment in a shipyard. In 1838, Sep., disguised as a sailor, and with a 'sailors' protection,' a certificate signed by the authorities and given all colored seamen leaving Baltimore and other Southern ports as a guarantee against molestation because of their race, which had been given him by a colored freeman, he fled from slavery, made his way to New York in safety, and then sought employment in the shipyards at New Bedford, Mass. He changed his name from Bailey to Douglass, married, and worked at whatever he could find to do. William Lloyd Garrison and other prominent anti-slavery leaders were favorably impressed with his intelligence, earnestness, and yearning for knowledge, aided him in his efforts toward self-education, and invited him to attend an anti-slavery convention at Nantucket, where he made a thrilling speech, 1841. Immediately afterward, he was appointed an agent of the Mass. Anti-Slavery Soc., and for four years travelled through the New England states, lecturing with great eloquence and effectiveness. Fearing that the prominence thus attained might lead to his capture and return to slavery, he went abroad 1845, and spent two years in lecturing on slavery in England, Ireland, Scotland, and Wales. In 1846 a number of persons interested in him, at the instance of Mrs. Henry Richards, of Baltimore, one of his earliest friends, subscribed $750 to purchase his freedom, and on Dec. 5, Hugh Auld signed a full release, liberation, and manumission for 'my negro man named Frederick Bailey, otherwise called Douglass.' Thus secure against capture, Douglass returned to the United States 1847, started *Frederick Douglass's Paper*, afterward *The North Star*, at Rochester, N. Y., and conducted it successfully several years. In 1859 he was accused of com-

plicity in the John Brown raid on Harper's Ferry, Va., and a warrant was issued for his arrest, but he escaped into Canada and thence to England. During the civil war he aided in enlisting colored troops for the Union army, and on the abolition of slavery applied himself to lecturing. In 1870 he became editor of the *New National Era* at Washington; 1871 was appointed assist. sec. to the Santo Domingo commission, and, on his return, a member of the territorial council of the District of Columbia; 1872 was presidential elector-at-large for N. Y. and bearer of the electoral vote to Washington; 1876 was appointed U. S. marshal for the District of Columbia and served till 1881, when he became recorder of deeds; and held that office till 1886, Apr. He was appointed secretary to the U. S. commission to San Domingo, 1871. He published *Narrative of My Experience in Slavery* (1844), *My Bondage and My Freedom* (1855), and *Life and Times of Frederick Douglass* (1881).

DOUR, or DOURE, a. *dôr* [W. *dewr*, bold: L. *durus*, hard]: in *OE.*, sour-looking; sullen; in *Scot.*, hard and impenetrable in body or mind: sullen; bold; stern.

DOUR, *dôr:* town of Belgium, province of Hainault, nine m. w.s.w. of Mons. It is well built and prosperous, and has several schools and a literary society. Coal and iron mines are worked in the vicinity; there are also many quarries, and there is some weaving, bleaching, and leather-dressing. Pop. 10,615.

DOURA (Millet): see DURRA.

DOURO, *dô′rō* (Span. *Duecēro*, Port. *Doūro*): one of the largest rivers of Spain and Portugal. It rises in the province of Old Castile, about 30 m. w. n. w. of the town of Soria. From its source it flows s.e. to Soria, then pursues a general w. direction till it reaches the Portuguese border; it then flows s.w., forming for about 60 m. the boundary between Spain and Portugal; then crossing Portugal and flowing w., it falls into the Atlantic below Oporto. Its Portuguese tributaries are comparatively small. Total length about 500 miles. The Douro is a noble river, and flows through some of the most imposing rock-scenery in the world, as at Barca d'Alva; but is rapid, and of difficult navigation, on account of rocks, sand-banks, etc. It passes through a large portion of the wine-country of Portugal, whose produce it bears in flat-bottomed boats, carrying from 30 to 70 pipes each, to Oporto for exportation.

DOUROUCOULI, *dô-rô-kô′lĭ:* monkey, native of Brazil and Guiana, resembling a cat in appearance and when passive sitting up like a dog; body 9 inches long and covered with gray fur on back and brown on belly; tail 14 inches long. It received from Cuvier the name of *nochtora* from its habit of sleeping in the daytime and prowling in search of food at night. It is very fierce when awake, has a piercing, disagreeable voice, and is almost incapable of domestication.

DOUSA, *dow'sâ*, JANUS (JAN VAN DER DOES): 1545, Dec. 6—1604, Oct. 8; b. Noordwyck, Holland: statesman and historian. He was educated at Lier, Delft, Louvain, Douai, and Paris; was among the nobles who formed a league against Philip II., 1565; was the head of an embassy to England 1572; and was intrusted with the govt. and defense of Leyden, when besieged by the Spaniards, 1574. When William I. of Orange founded the Leyden Univ., he appointed Dousa its first curator, and this office he held nearly 30 years. In 1584, he was sent to England to seek the aid of Queen Elizabeth, and appointed keeper of the Dutch archives, and 1591 removed to the Hague on being appointed a member of the states-general. He was the author of the *Annals of Holland*, printed in metrical form 1599 and in prose 1601, and several vols. of Latin verse and of philological notes on Horace, Catullus, Tibullus, Petronius Arbiter, and Plautus.

DOUSE, or DOWSE, v. *dows* [a probable corruption of DOUCHE, which see: Scot. *dook*, to plunge under water: Dut. *doesen*, to push with force and noise]: to thrust into water; to lower or slacken suddenly; in *slang*, to extinguish as a light. DOUS'ING, imp. DOUSED, pp. *dowst*.

DOUT, v. *dowt* [contr. of *do out*]: in *OE.*, to put out; to extinguish.

DOVE, n. *dŭv* [Dut. *duyve*; Icel. *dufa*, a dove—probably from the same root as *dive*, because of its habit of ducking the head—from Dut. *duypen*, to duck the head—compare Lat. *columba* with Gr. *Kolumban*, to dive]: a pigeon; the term is sometimes used as a word of endearment. The name is sometimes extended, as the name pigeon, to the whole family of *Columbidæ;* sometimes restricted—at least when used without prefix—to the genus *Columba* of the more recent ornithological systems. No distinction between the terms dove and pigeon is sanctioned either by constant scientific or general popular use. Audubon attempts to make a distinction, giving the name pigeon to those species of which many nests are built close together on the same trees, and dove to those which are solitary in their nidification; but this distinction is unsuitable to the European species, and contrary to British usage. Other attempts at distinction have not gained acceptance. See PIGEON. DOVE-COTE, or DOVE-COT, a small house for pigeons. DOVE-DOCK, n. the coltsfoot, *Tussilago Farfara*. DOVE-FLOWER, n. in *bot.*, the genus *Peristeria*, DOVE-KIE, n. in *ornith.*, a name given to the Black Guillemot (*Uria grylle*) a native of the Arctic regions. DOVE'S-FOOT, n. in *bot.*, popular name of *Geranium molle*, from the form of the leaf; the columbine, *Aquilegia vulgaris*. DOVETAIL, n. *-tāl*, a method of fastening the ends of pieces of wood together, by slipping the one, cut in the form of a dove's tail, into the correspondent notches of another; a strong way of jointing: V. to joint or unite strongly. DOVETAILING, imp. DOVETAILED, pp. *tāl* DOVETAIL-HINGE, n. a hinge whose leaves are wider at their outer edges than

at their hinging edges. DOVETAIL-MOLDING, n., in *arch.*, a kind of molding used in Roman architecture, and somewhat resembling a dovetail. DOVETAIL-PLATES, n. in *ship-build.*, plates of metal let into the stern post and keel of a vessel to bind them together. Similar plates are used for joining the stern-foot with the fore-end of the keel. DOVE'LET, n. a little dove.

DOVE, in Christian Art: an emblem of the Holy Spirit, no doubt from the dove-like form in which the Spirit descended on the Lord Jesus at his baptism. From the dove being used also to symbolize purity, it is generally represented white, with its beak and claws red, as they occur in nature. In the older pictures, a golden nimbus surrounds its head; the nimbus being frequently divided by a cross, either red or black. In stained glass windows the dove is seen with seven rays proceeding from it terminating in seven stars, significative of the seven gifts of the Holy Spirit. Holding an olive branch, the dove is an emblem of peace. When seen issuing from the lips of dying saints and martyrs, it represents the human soul purified by suffering. A dove with six wings is a type of the church of Christ; and when so employed, it has the breast and belly of silver, and the back of gold, two wings being attached to the head, two to the shoulders, and two to the feet. The pyx or box for containing the Host (q.v.) in Rom. Cath. churches, is sometimes in the form of a dove, and suspended over the altar; and the dove is often placed on the covers of fonts. In this position it may still be seen in parish churches in England.

DOVE, *dō'vĕh*, HEINRICH W.: one of the ablest recent physicists of Europe: 1803-1879, Apr. 6; b. Liegnitz, Silesia, where his father was a merchant. He studied at Breslau and at Berlin, taking his degree at Berlin 1826. He was successively 'privatdocent' and asst. prof. of nat. philosophy in Königsberg. Having been transferred to a similar post in Berlin, he subsequently became full prof. and was elected to a seat in the Royal Acad. of Sciences. His writings, which are very numerous, are in the Memoirs of that Acad., and in Poggendorff's Annalen, besides several published separately. The most celebrated refer to meteorology, climatology, induced electricity, and circularly polarized light. Among his works are *Ueber Mass und Messen* (2d ed., Berlin 1835), a treatise on the art of measuring, and the origin and comparison of the metrical standards of different nations; *Meteorologische Untersuchungen* (Berlin 1837); *Ueber die nicht periodischen Aenderungen der Temperaturvertheilung auf der Oberfläche der Erde* (4 vols. Berlin 1840-47); *Untersuchungengen in Gebiete der Inductionselectricität* (Berlin 1843). In conjunction with other distinguished German philosophers, Dove commenced, 1837, the publication of an extensive series of treatises on different branches of nat. philosophy. This work, called *Repertorium der Physik*, remains unfinished. In his capacity of director of all the Prussian observatories, he published annually an account of their

REPRESENTATIVE DOVES.

1. Domestic Turtle-dove (*Turtur risorious*).
2. European Wood Pigeon (*Columba palumbus*), at the left, and Stock-dove (*C. aenas*) at the right.
3. American Wild or Passenger Pigeon (*Ectopistes migratorius*).
4. Papuan Crowned Pigeon (*Goura albertisi*).
5. Crested and Common Australian Bronze-winged Doves.
6. Blue Rork-dove (*Columba livia*).

labors. To him is due, among a great variety of optical discoveries, the application of the stereoscope to the detection of forged bank-notes—an ingenious and useful idea. To English readers, Dove is known best by his treatise on the *Distribution of Heat on the Surface of the Globe*, published 1853 by the British Association.

DOVER, *dō'vėr*, Delaware: capital of the state and county-seat of Kent co.; on Jones creek, and the Philadelphia, W. & B. R. R., 75 miles s. of Philadelphia. It is in the center of a great fruit-growing region, and commands a large fruit-canning trade. The town is built on high ground, with straight, rectangular streets, and the houses are mostly composed of brick. Among the noteworthy buildings are a handsome state-house, court-house, and new U. S. postoffice. In the state-house there is a state library of more than 30,000 volumes. The school facilities are excellent, including an agricultural and manual training school for colored students; there are several churches, a national and a state bank, fruit evaporating and packing establishments, steam flour-mill, foundry, machine shop, and sash, fruit crate, glass, and carriage factories; also two weekly newspapers. The city owns its gas and water works. Dover is one of the old revolutionary towns. It was laid out in 1717, and became the capital of Delaware in 1777; but it was not incorporated as a town until 1829. It contains several monuments to persons distinguished in revolutionary history, and is interesting in its historical associations. Pop. (1900) 3,329; (1910) 3,720.

DOVER, New Hampshire: city, capital of Strafford co., situated on both sides of the Cocheco river at the head of navigation, and on the Boston & Maine R. R. It is the oldest city in the state, having been first settled in 1623, but was not organized as a town until 10 years later. It received its present name in 1639, and was chartered as a city in 1855. For more than a century it was a frontier town and suffered from frequent attacks by savages, the most disastrous occurring in 1689, June 28, when 23 of the inhabitants were killed, 29 carried into captivity, and most of the houses were destroyed. The falls of the Cocheco are within the city limits, and they afford a fine water-power; additional power is obtained from Black river, s. of the city. Bow Pond, 15 m. n.w., has been converted into a storage reservoir, and in the dry season water for the mills is procured from that source. Among the industries are several large cotton and woolen mills; extensive print works, with a capacity of more than 30,000,000 yards annually; manufactories of boots and shoes, oil-cloths, hats and caps, sandpaper and glue; and several tanneries, brass and iron foundries, machine shops, etc. There are about 40 public schools, the place being remarkably well supplied in this respect; also St. Joseph's Hill School and the Franklin Academy. The city is supplied with electric lights and street railways, several banks, daily and weekly newspapers, and a num-

ber of churches. Dover is a typical New England town, with its green lawns, its clean and well kept streets, and that general air of thrift and tidiness which are characteristic of the section. Pop. (1910) 13,247.

DO'VER, parliamentary and municipal borough in the east of Kent, England, 66 m. e.s.e. of London; headquarters of the s.e. dist. of the British army. It is not only a charmingly situated watering-place, but, being the nearest point of the English coast to France, is a seaport of rapidly growing importance. Within the last few years £750,000 have been expended by the govt. in constructing a magnificent pier, which extending 2,100 ft. seaward, terminates in a fort fitted to bear two guns of heavy caliber, so mounted, that they will completely sweep the channel. This granite isthmus affords a safe anchorage for vessels in the stormiest weather, and travellers for Calais, about 25 m. distant, or Ostend, for which places passenger and cargo steamers leave twice a day, are enabled to embark or land in any state of the tide, or even when a gale is raging. Works which will cost over a million pounds are contemplated by the government to carry out a scheme for the erection of Dover Bay into a naval rendezvous and coaling-station. The fortifications comprise Dover Castle, which occupies a commanding position on the chalk cliffs, 375 ft. above the sea, and in the construction of which Saxons and Normans displayed no small amount of ingenuity; the Western Heights, Fort Burgoyne, the South Front, the Drop Redoubt, the Citadel, the Western Outworks and the North Centre Bastion. No special trade is attached to the town, which transacts a miscellaneous maritime business with the French and Belgian ports. The borough returns, since 1885, one member to parliament. Dover is well sheltered by the cliffs, and ends landward in a charming valley leading to what is known as 'The Garden of Kent.' In Roman days Dover was known as Duris; the Normans called it Dovere; the French, Douvres; while in legal documents of this day the town is Dovar, all four terms being variations of the word 'Dour,' the name of the small river which runs through the town. Fortified and walled by William the Conqueror, during whose reign it was nearly burned down, noted as the place of King John's submission to the pope, besieged by the French, held during the civil war by the Parliamentarians, threatened by the first Napoleon, and celebrated as the headquarters of the Lord Wardens of the Cinque Ports, Dover holds a distinguished place in English history. Three submarine cables connect it with the continent, and if the designs of eminent French and English civil engineers are practicable, a tunnel may be constructed under the Channel, which will bring France within an hour or an hour and a half's journey from Dover. Pop. (1901) 39,558.

DO'VER, Strait of (*Fretum Gallicum, Pas de Calais*): the sea-channel between England and France, connecting the English Channel and North Sea, whose tides meet here. It is 18 to 25 m. broad, and 6 to 29 fathoms deep, but at

Warne and Ridge Shoals only 1½ to 4 fathoms. The English coast consists of chalk cliffs 300 to 600 ft. high, succeeded on the south by lower greensand, and the French from Calais to Cape Grisnez, is of similar strata. Britain and the continent seem to have been once united here by an isthmus. In 1875, Aug., Captain Webb, English naval officer, accomplished the wonderful feat of swimming the Strait of Dover in 21¾ hours.

DO'VERON, or DE'VERON: river of the n.e. of Scotland rising in the w. of Aberdeenshire, a little s. of the Buck of the Cabrach (2,377 ft. high). It runs 55 m. n.e. (36 in a straight line), through adjacent parts of the counties of Aberdeen and Banff, and partly dividing them, past Huntly to the North Sea at Banff. It drains a basin of 10 sq. m., composed of syenitic greenstone, metamorphic rocks, graywacke, and old red sandstone.

DO'VRE FJELD: see SCANDINAVIA.

DOW: see BAGGALA.

DOW, or DOU, or DUOW, GERARD: 1613-80; b. Leyden: one of the most exquisite of Dutch *genre*-painters. He received his first instructions in drawing from one Dolendo, a draughtsman, and at the age of 15 entered the school of Rembrandt. That marvellous genius for color which the latter possessed, fascinated the young painter, who soon showed a similar mastery over *chiaroscuro*, though developing artistic qualities wholly different from those of his master. The most insignificant incidents of daily life were precious to Dow, and were delineated with a delicacy, neatness and care, that could not be surpassed. In his workshop, the utmost cleanliness prevailed. Dow was true to nature in a degree positively wonderful. The richness, transparency, vigor, and harmony of his coloring are beyond all praise. In consequence, his pictures, though generally small in size, are considered gems of art, and have brought astonishing prices. One of his best works, *The Dropsical Woman*, is valued at 30,000 guilders. Among his pieces are *The Village Grocer*, *The Dutch Cook*, *The Mountebank*, *The Fiddler*, *The Dentist*, and *The Interior of a Household*. His works, which are numerous, are in all the great European collections. Dow died at Leyden.

DOW, LORENZO: 1777, Oct. 16—1834, Feb. 2; b. Coventry, Conn.; Meth. Episc. minister. He received a very meagre education and in early youth he resolved to become a Meth. preacher. After rejection 1796, he was received into the Conn. conference 1798, appointed to the Cambridge (N. Y.) circuit 1799, and served there, in Pittsfield, Mass., and Essex, Vt., less than a year, making a visit to England and Ireland in the latter part of 1799, and again 1805. He felt that he had received a divine call to preach to the Rom. Catholics in Ireland, and while there attracted large audiences by his eccentricities and eloquence. In England he established the American system of camp-meetings, and occasioned a great controversy in the

Meth. church thereby. Between his visits to England and Ireland, he preached the first Prot. sermon in Ala., and subsequently labored in La., and in many of the new settlements in the s. and s.w. He was author of *Polemical Works* (1814), *The Stranger in Charleston, or the Trial and Confession of Lorenzo Dow* (1822), *A Short Account of a Long Travel, with Beauties of Wesley* (1823), *Journal and Miscellaneous Writings*, and *History of a Cosmopolite, or the Writings of the Rev. Lorenzo Dow, containing his Experience and Travels in Europe and America up to near his Fiftieth Year.*

DOW, Neal: reformer: 1804, Mar. 20—1897, Oct. 2; b. Portland, Me. He was educated in the Friends' Acad., New Bedford, Mass., and entered a mercantile and manufacturing career. In 1839 he became chief eng. of the fire dept., in Portland, 1851 was elected mayor of the city, and 1854 re-elected. While serving his first term as mayor he drafted a bill for the prohibition of the sale of intoxicating beverages through the state, and though its radical character threatened its defeat, he carried it successfully through the legislature, and it continues a law to-day. In 1858 he was elected a member of the legislature, and 1861, Dec., was appointed col. of the 13th regt. of Me. vols. He accompanied Gen. Butler's expedition to New Orleans; was promoted brig. gen. of vols., and assigned to the command of the forts at the mouth of the Mississippi, 1862, Apr. 28; was twice wounded in the battle of Port Hudson 1863, May, and taken prisoner while helpless; was confined in Libby Prison, Richmond, and in Mobile nearly a year; and resigned his commission 1864, Nov. 30. He made three trips to England by invitation of the Temperance Alliance of the United Kingdom and spoke in all the large cities. In the U. S. he labored indefatigably in behalf of prohibitory legislation. Gen. Dow was the candidate of the national prohibition party for pres. 1880.

DOWAGER, n. *dow'ă-jer* [F. *douairière*, a dowager—from mid. L. *dotārĭŭm;* F. *douaire*, a dowry]: a title given to the widow of a prince or person of rank when he who succeeded her deceased husband in his titles and estates is married, there being thus two ladies with the same title; a widow of rank, with property or real estate enjoyed by her during her lifetime. Queen-dowager, n. widow of a king. Dow'agerism, n. *-ĭzm*, state, rank, or condition of a dowager.

DOW'DEN, Edward, ll.d.: b. Cork, Ireland, 1843, May 3: poet. He was educated at Queen's College, Cork, and Trinity College, Dublin; obtained the vice-chancellor's prizes in English verse and English prose in the latter institution; was elected pres. of the Philosophical Soc., and gained the first senior moderatorship in logic and ethics 1863; studied divinity two years; gained the Erasmus Smith professorship of oratory in the Univ. of Dublin on competitive examination 1867; and was subsequently elected prof. of English literature there. He is author of

Shakespeare: His Mind and Art (1872), *Poems* (1876), *Shakespeare Primer, Studies in Literature* (1878), *Southey* (English Men of Letters Series, 1879), *Goethe*, and *Life of Percy Bysshe Shelley* in 2 vols., founded on the family papers. He has contributed to the leading reviews and magazines of England and the United States

DOWDY, n. *dow′dĭ* [Scot. *dawdie*, a dirty, slovenly woman: Low Ger. *dödeln*, to be slow: Icel. *dodi*, languor: comp. Gael. *daoidh*, feeble, foolish]: a woman awkward and untidy in dress: ADJ. awkward and slovenly in dress; ill-dressed, applied only to a woman. DOW′DYISH, a. *-ĭsh*, like a dowdy.

DOWEL, n. *dow′ĕl* [F. *douelle* and *douille*, a tap or socket: Ger. *döbel*, a peg, a plug: Dut. *douwen*, to press into]: a projection in a stone to fit into a socket, by which it may be fastened into the adjoining one; a peg of wood or iron used in the edge of a board for fastening it to another, usually edge to edge: V. to fit with dowels. DOW′ELING, or DOW′ELLING, imp.: N. a method of uniting two pieces of wood together at their edges by pins or plugs of wood or iron. DOWEL-PIN, a pin inserted into a piece of wood in order to unite it to another, generally edge to edge.

DOWER, n. *dow′ĕr*, or DOWRY, *dow′rĭ* [OF. *doaire*; F. *douaire*, a dowry—from mid. L. *dotārĭŭm*—from L. *dotārĕ*, to endow] the property which a woman brings to her husband on marriage. DOW′ERED, a. *-ĕrd*, having a dowry. DOW′ERLESS, a. without a dowry.—Also, *Dower* 'in the common law, is taken for that portion of lands or tenements which the wife hath for terme of her life of the lands or tenements of her husband after his decease, for the sustenance of herselfe, and the nurture and education of her children.'—*Coke upon Litt.* 30 *b*. The right of dower has lost much of its ancient importance. See FINE: JOINTURE.

The general rules of the English common law still prevail in the United States, and in nearly all the states at least one-third of the personal estate of the husband is given to the widow. In some states a widow has the right to elect to take one-half of the husband's estate in lieu of dower under certain contingencies, and a contract to marry on condition that the wife should receive no portion of the husband's lands has been held valid. The right to dower is determined by the laws of the place where the property is located. Usually a widow is not endowable for a term of years, however long, though in Mo. her right attaches to a leasehold of 20 years and to the personal estate in general, under certain conditions, and similar statutes are found in other states. An estate in common is subject to dower. In an exchange of lands a widow may claim dower in either, but not in both; she is entitled to dower also in mines belonging to her husband if opened by him, in various species of incorporeal hereditaments, as rights of fishing and rents, and, in most states, in wild lands; but she has no right of dower in a pre-emp-

tion claim, nor as a rule, in shares of a corporation. Some statutes give her dower in lands actually purchased by her husband and on which the former owner retains a lien for the unpaid purchase money, subject to that lien; or in lands upon which her husband has given a mortgage to secure the purchase money, subject to that mortgage; but she has been denied dower in partnership lands purchased by partnership funds for partnership purposes, till the partnership debts have been paid; also in land purchased by several persons for speculative purposes. Her claim for dower has been held not subject to mechanics' liens, and as good against every one but the mortgagee where she has joined her husband in mortgaging an estate.

DOWIE, a. *dow'ĭ* [Gael. *dubhach*, sorrowful, sad—from *dubh*, black, dark]: in *Scot.* and *prov. Eng.*, dark; dull; spiritless; melancholy; worn out with grief. DOWFF, a. *dowf* [comp. Ger. *dumpf*, hollow, dull]: dreary; forlorn. DOWFF AND DOWIE, dreary and spiritless.

DOWIE, JOHN ALEXANDER: religionist; b. in Scotland; d. Chicago, 1907, March 9; was a pastor in Australia; later came to the U. S. and settled in Chicago, Ill.; became a 'healer,' a real-estate operator, newspaper proprietor, and a manufacturer. He founded a lace-making industry near Waukegan, Ill., and called the place Zion and his followers Zionites. He announced that he was the Prophet Elijah returned to earth. His teachings and methods have been severely condemned by the pulpit and press. In 1905 he made an effort to establish a colony in Mexico, in which the principles of polygamy were sufficiently prominent to excite the opposition of his family and most of his followers, and in 1906 he was relieved of the control of Zion and practically removed from his position in the church of his founding.

DOWLATABAD, *dow-la-ta-bâd'* (in English, *Abode of Prosperity*): strongly fortified town of Hindustan, within the Nizam's dominions, near the n.w. frontier; lat. 19° 57′ n., and long. 75° 19′ e. The town is commanded by a rock-fortress, which, with a height of about 500 ft., is scarped into a perpendicular for the lowest third of the altitude. This stronghold is all the more formidable from its being completely isolated, being fully 3,000 yards distant from any other eminence. The town of Dowlatabad has recently greatly decayed, and only a small portion of it is now inhabited.

DOWLE, n. *dowl* [F. *douillet*, soft, downy—a dimin. of OF. *douille*, soft, tender: comp. Gael. *duille*, a leaf or spray]: in *OE.*, a leaf; a feather; a portion of down of birds, young hair of the beard: ADJ. leafy; feathery; downy.

DOWN, n. *down* [Ger. *daune;* Icel. *dún;* Dan. *duun*, the lightest and softest kind of feathers: Ger. *dunst*, exhalation, vapor]: the fine soft feathers of fowls; any fine hairy substance, light enough to float in the air. DOWN'Y, a. *-ĭ*, soft, like down.

DOWN, ad. or prep. *down* [AS. *of dune*, from the hill, as in OF. *à mont*, to the hill, *à val*, to the valley, expressing 'upward and downward' (see DOWNS)]: from a higher to a lower place; in a descending direction; on the ground, extended or prostrate on any surface; toward the mouth of a river; below the horizon, as the sun; into a due consistence, as, to boil down; into bad odor or disgrace, as, to cry down. DOWN-BOW, n. in *mus.*, the bow drawn over the strings from the heel or holding part of the bow to the point; the greatest power of tone in the strings is elicited by the down bow, and accordingly it is commonly used on the accented beats of a bar. DOWNCAST, a. *-kast*, dejected; directed to the ground, as the eyes or the face; applied to that part of the shaft or perpendicular excavation of a mine which conveys the ventilating air downward into it, the *upcast* being the shaft carrying the foul air up from the mine. UP AND DOWN, here and there. DOWNCOME, n. a sudden fall of anything. DOWN-EASTER, n. [colloq.]: native or inhabitant of New England. DOWNFALL, n. *-fawl*, ruin; destruction; ruin by violence or decay; sudden fall or depression. DOWNFALLEN, a. *-fawln*, ruined; fallen. DOWN-HAUL, n. *naut.*, a rope for hauling down a staysail, jib, or other fore-and-aft sail. With stay-sails it passes along the stay through the cringles, and is attached to the upper corner: V. to haul or pull down. DOWN-HEARTED, cast down; dejected in spirits. DOWNHILL, n. descent; slope: ADJ. sloping. DOWN-LYING, n. time of rest or repose: ADJ. *familiarly*, about to be in childbirth. DOWNRIGHT, a. plain; open; undisguised; blunt: AD. in *OE.*, straight or right down. DOWNRIGHTLY, ad. *-lĭ*. DOWNRIGHTNESS. n. DOWN-SHARE, n., in *agri.*, a turf-paring plow, used in England, where the rolling treeless tracts are called Downs. These tracts in Sussex are the home of the Southdown sheep. DOWN-SITTING, rest; act of sitting down. DOWN-TRAIN (in *Britain*), a train on its way from London to any provincial terminus. DOWN THE RIVER, toward its mouth, as going with its flow. DOWNTROD, or -TRODDEN, trampled down; oppressed. DOWNWARD, a. extending from a higher to a lower state or place; tending toward the earth. DOWN'WARD, or DOWN'WARDS, ad. *-wĕrdz*, in a descending course; from a higher to a lower state or place. *Note.*—Persons in London say, *down* to Scotland, etc., and those in the provinces, *up* to London; so in most countries *up* is towards the capital, and *down* is from the capital.

DOWN: maritime county in the s.e. of Ulster Province, Ireland; 51 m. long, 38 broad; 957 sq. m., five-sixths being arable, and one three-hundredth in wood. It has a coast-line of 67 m. (or 125 by the inlets), mostly low and rocky and with many isles off it. The chief inlets are Belfast Lough, 3 m. broad, and 15 long; Strangford Lough, ½ to 3 miles broad, 10 m. long; Dundrum and Carlingford bays. The Mourne Mountains cover 90 sq. m. in the south, and rise 2,796 ft. in Slieve Donard. The other parts of Down are mostly undulating and hilly, with plains and fine

meadows along the rivers. The chief rocks are Lower Silurian - covering most of the county - and granite, composing the Mourne and Croob mountains. The chief rivers are the Upper Bann and the Lagan. The Newry canal admits vessels of 50 tons, and with the Ulster Canal opens communication through almost all Ulster. Thick marl beds occur in the alluvial tracts. The soils are chiefly stony and clayey loams. In 1891 282,740 acres, out of the total 612,495 were in crop. The chief crops are oats, potatoes, turnips, wheat, flax, and barley. Many pigs are reared. The chief manufacture is linen, especially the finer fabrics, as muslin, woven in the houses of the small farmers. Flax and cotton mills have become common. Hosiery, leather, salt, thread, and woolens also are made. These, with corn, butter, pork, and hides, are the chief exports. Down is among the best cultivated Irish counties, and has more resident gentry (almost all Protestants, of English and Scotch descent) than any other Ulster county. It contains 10 baronies, 5 poor-law unions, and 70 parishes. The chief towns are Downpatrick, Newry, Newtownards, Bannbridge, and Donaghadee. Since 1885, the county of Down sends four members to parliament, besides one for the borough of Newry. Down has many ancient remains, as raths, round towers, castles, and abbeys. On the top of Slieve Croob (1,755 ft. high) are 23 stone cairns, one 54 ft. high. Presbyterianism prevails in the towns and low country, and Rom. Catholicism among the mountains and in the barony of Lecale. Pop. 205,889.

DOWNES, *downz*, JOHN: 1786–1855, Aug. 11; b. Canton, Mass.: naval officer. He entered the U. S. Navy as midshipman 1802, June; served on the *New York* in the war with Tripoli; was commissioned lieut. 1807, March; executive officer of the *Essex* under Capt. Porter 1812–14; promoted master-commandant 1813; commanded *Epervier* in the squadron under Com. Decatur operating against Algiers 1815, captured the Algerine frigate *Nashouda* June 17, and assisted in the capture of the brig *Estido* June 19, and was transferred to the *Guerrière* after peace. He was promoted capt. 1817, March; commanded the *Macedonia* 1819–21, the *Java* in the Mediterranean 1828–9, and the Pacific squadron 1832–34; nearly destroyed the village of Quallah Batoo, Sumatra, whose people had committed atrocities on American seamen 1832; and was in command of the navy-yard at Boston 1837–42 and 1850–52.—His son JOHN A. Downes (1822, Aug. 25—1865, Sep. 20), became a commander in the navy 1862, commanded the *Nahant* in the bombardment of Fort McAlister 1863, Mar. 3, and the attack upon Fort Sumter 1863, Apr. 7, aided in the capture of the Confederate iron-clad *Atlanta*, and died in command of the Gulf squadron.

DOWN'HAM MARKET: town in the w. of Norfolk county, England; on a hillside, on the right bank of the Ouse, 40 m. w. of Norwich, 10½ s of Lynn Regis. It lies amid fen and dairy land. Pop. (1881) 2,631. It has a

bell-foundry, and a celebrated butter-market. By the Ouse and Cam, small vessels proceed from Lynn on the coast to Cambridge, 30 m. above Downham Market. A market was confirmed here in the time of Edward the Confessor. Pop. (1901) 2,742.

DOWNING, Andrew Jackson: 1815, Oct. 20—1852, July 28; b. Newburg, N. Y. He was bred to his father's occupation, nurseryman, attended the Montgomery Acad. a short time, and when 16 years old was placed with a brother in charge of the nursery. While so employed he began a systematic course of self-instruction, applying himself with keen interest to horticulture, botany, landscape-gardening, and the natural sciences. He visited all the fine estates within reach, wrote descriptions of rural scenery for the New York *Mirror*, exemplified his idea of a perfect rural home by building a grand house on his estate, inspected the chief country seats of England 1850, was engaged by the govt. to lay out and plant the public grounds of the U. S. Capitol, the White House, and the Smithsonian Institution 1851. He lost his life by drowning at the burning of the steamer *Henry Clay* on the Hudson river. He published *Treatise on the Theory and Practice of Landscape Gardening* (1841), *Cottage Residences* (1842), *Fruit and Fruit Trees of America* (1845), *Additional Notes and Hints to Persons about Building in the Country* (1849), *Architecture of Country Houses, including Designs for Cottages, Farm-houses, and Villas* (1850), and was editor of the Albany *Horticulturist* from 1846 till his death.

DOWN'ING, Sir George: 1624–84; b. Dublin: statesman. He accompanied his father to Salem, Mass., 1638 graduated at Harvard Univ. 1642, removed to England 1645, and after preaching some time among the Independents, and serving as a chaplain in Cromwell's army, became a member of parliament for a Scottish borough, 1654 and '56, and agent in Holland 1658–60. On the downfall of Cromwell he turned royalist, was knighted 1660, returned to parliament and reappointed envoy to Holland 1661, became sec. of the treasury and commissioner of customs, was created a baronet 1663, recalled from a special mission to Holland and imprisoned in the tower 1671; and subsequently regained the king's favor. Downing street, London, was named after him, and one of his grandsons founded Downing College, Cambridge, Eng.

DOWNPAT'RICK (Mount of Patrick), or simply Down: municipal and cathedral town in the south of County Down, of which it is the capital. It is near the mouth of the Quoyle, which flows into the s.w. end of Lough Strangford, 74 m. n.n.e. of Dublin; 21 m. s.s.e. of Belfast, with which town it is connected by railway. The cathedral was restored 1790 on the site of one built 1412, and burned 1538 by Lord Deputy Grey. A handsome Rom. Cath. church was erected here 1872. Vessels of 100 tons reach the quay a mile from Downpatrick. It has manufactures of linen, soap, leather, and malt liquors. Northwest of Down-

patrick are the remains of great earth-works, three-quarters of a m. in circuit, inclosing a conical rath 60 ft. high and 2 100 in ircumference. Downpatrick was famous before the arrival of St. Patrick, who founded religious establishments here. Downpatrick was burned by Edward Bruce 1315 and plundered by O'Neil 1552. The holy wells of St. Patrick at Struel, 1½ mile e. of Downpatrick, were formerly resorted to by Rom. Cath. pilgrims from all Ireland, but for the last 50 years the pilgrimage has ceased. Pop. (1900) 3,000.

DOWNS, n. plu. *downz* [Dut. *duyne;* F. *dunes*, sandhills by the sea-side: Fris. *döhne*, a hillock of sand or snow: AS. *dún, a* hill, downs: Gael. *dun*, a hill, a fortification]: elevations of sand thrown up by the sea or the wind along the coast; broad ridges of elevated land near the sea, too light for cultivation, covered with close and fine turf; a flattish-topped hill. The name is applied specially to two broad ridges of undulating hills s. of the Thames, beginning in the middle of Hampshire, and running e., one (the North Downs) through the middle of Surrey and Kent to Dover (about 120 m.), and the other (the South Downs) through the s.e. of Hampshire and near the Sussex coast to Beachy Head (about 80 m.). Between the two ranges lies the valley of the Weald, from which the chalk strata are supposed to have been removed by denudation. Toward the Weald, the descent from both Downs is rapid, and presents cliffs as of a sea-margin; while the opposite slopes are gradual. The highest point of the North Downs is Botley Hill, 880 ft.; and of the South Downs, Ditchelling Beacon, 858 ft. These uplands are covered with fine short pasture, which from its aromatic quality, forms excellent feeding-ground for the famous South Down sheep. The valleys among the hills are usually fertile, and admit of cultivation, so that an excellent field is furnished for mixed husbandry. By pasturing the sheep on the Downs during the day, and folding them on the arable fields at night, the latter are fertilized.

DOWNS, *downz*, The: important roadstead or shelter for shipping, off the s.e. coast of Kent, opposite Ramsgate and Deal, between N. and S. Foreland, and protected externally by the Goodwin Sands—a natural breakwater with one to four fathoms water, and often partly dry at low tide. This large natural harbor of refuge is eight m. by six, with an anchorage of four to twelve fathoms. It is resorted to temporarily by outward and homeward bound vessels, and squadrons of ships of war, and is unsafe only in south winds. It is defended by Deal, Dover, and Sandown castles. The Small Downs, an appendage of the Downs proper, lies inside the Brake Sand, has from 2½ to 5 fathoms water, and is about 2 m. wide.

DOWN'TON: town in the s.e. of Wiltshire, England, on the right bank of the Avon, here divided into three branches, six m. s.e. of Salisbury. It consists chiefly of one long street with the houses irregularly placed. It has

a paper-work, and an ancient cross. Downs, in the middle ages, had a castle, of which the mound or moat remains, and is a singular earthwork, on which Saxon justice was dispensed. Two m. n. of Downs is the mansion and estate of Standlinch, the national gift to the heirs of Lord Nelson, for which parliament voted £100,000. Pop. 6,136

DOWNY, a. see under Down 1.

DOW-PURSE, n.; a considerable sum of money anciently put into a purse and presented at the wedding by the bridegroom to the bride.

DOWRY, n.: see under Dower.

DOWSE, v. *dows:* see Douse.

DOXIE, a, *dŏks'ĭ* [Icel. *dosk.* inactivity]: in *Scot.*, lazy; restive.

DOXOLOGY, n. *dŏks-ŏl'ŏ-jĭ:* [Gr. *dŏxŏlōgĭă*, giving glory —from *doxa*, praise, glory; *logos*, a word]: a hymn or prayer ascribing praise to God; solemn form of giving glory to God, such as the apostle Paul uses at the close of his epistles, and sometimes even in the middle of an argument (Rom. ix. 5). The hymn of the angels (Luke ii. 14) also is called a doxology; likewise is the close of the 'Lord's Prayer.' The so-called 'Great Doxology' is simply an expression of the angelic hymn of Luke ii. 14, and is sung in the Rom. Cath. Church at the celebration of the Lord's Supper, and at matins. It begins with the words, *Gloria in excelsis Deo* ('Glory to God in the highest').. The ordinary doxology (Gloria Patri) 'Glory be to the Father, and to the Son, and to the Holy Ghost, as it was,' etc., is repeated at the end of each psalm in the service of the Church of England. There are numerous doxologies in verse to suit different metres.

DOXY, or Doxie, n. *dŏks'ĭ* [perhaps a corruption of *ducksy*, a dim. of *duck*, a dear: comp. F. *doux*, sweet, soft]: in *cant* and *slang*, the female companion of a tramp, gypsy, beggar or thief; in *OE.*, a lady-love; a mistress; a sweetheart; in *prov. Eng.*, a little girl, in a familiar and endearing sense. *Note.*—Doxy may have been introduced from the Netherlands. We have *docka*, a doll: Fris. *dokke*, a doll; *doktje*, a small bundle; comp. Duck, a dear, a darling.

DOYLE, *doyl* A Conan, m.d.: British novelist: b. Edinburgh 1859, May 22. After studying at Stonyhurst college. Lancashire, he entered Edinburgh Univ., graduating 1881. His training was for the medical profession, but his tastes early drew him into literature, in which his success was brilliant. He made a tour of U. S., 1895, and in the summer of 1896 was war correspondent for the *Westminster Gazette* with the Eng. army in the Soudan. Among his tales are: *Micah Clarke* (1889); *A Study in Scarlet* (1890); *The Firm of Girdlestone* (1890); *The White Company* (1891); *Captain of the Polestar* (1892); *The Adventures of Sherlock Holmes* (1892); *The Refugees* (1893); *The Sign of Four* (1893) *The Memoirs of Sherlock Holmes* (1894); *The Stark Munro Letters* (1895); *Rodney Stone* (1896); *Songs of*

Action (1898); *The Great Boer War* (1900); *Cause and Conduct of the War* (1900); *The Hound of the Baskervilles* (1902); *The Adventures of Girard* (1903); *The Return of Sherlock Holmes* (1905). *The Story of Waterloo* was dramatized for Sir Henry Irving; *Sherlock Holmes* by William Gillette. Doyle was knighted in 1902.

DOYLE, C. W., American physician and author: b. Landour, India 1852, Aug. 29; d. Santa Cruz, Cal., 1903. He was educated at Calcutta University, studying medicine in London, Edinburgh, and Aberdeen. He was graduated from the latter in 1875, and practised in England till 1888, when he went to California, continuing his practice there. He has published much verse and prose in the magazines, and the volumes *The Taming of the Jungle* (1889); *The Shadow of Quong Lung* (1899).

DOYLE, *doyl*, RICHARD: Eng. caricaturist: 1826–1883, Dec. 11; b. London. He became a contributor to *Punch*, but withdrew 1850 because of its criticisms of the Rom. Cath. Church, of which he was a member. His book illustrations were admirable, the best being *Adventures of Brown, Jones, and Robinson*, and of the *Newcomes*. His caricatures show genial humor and graceful drawing.

DOYLT, or DOILT, a. *doylt* [Gael. *doillead*, darkness, blindness]: in *Scot.*, stupid; stupefied; crazed: see DOLT.

DOZE, v. *dōz* [Icel. *dusa*, to doze: Bav *dosen*, to keep still: Dan. *dose*, to doze, to mope: comp. Gael. *dusal*, sleep]: to be half asleep; to be drowsy; to sleep lightly; N. a light sleep. DO'ZING, imp. DOZED, pp. *-dōzd*. DO'ZER, n. one who. DOZY, a. *dō'zĭ*, sleepy; drowsy. DO'ZINESS, n. *-zĭ-nĕs*, drowsiness.

DOZEN, a. *dŭz'n* [OF. *dozaine:* F. *douzaine*—from F. *douze;* OF. *doze*, twelve—from mid. L. *dozēnă*, a dozen—from L. *dŭŏdĕcĭm*, twelve]: twelve in number of the same kind: N. twelve of things of a like kind. BAKER'S DOZEN, thirteen. In the days when bakers were punishable by law if their bread or cakes fell short in weight, they were accustomed to give thirteen for a dozen, to prevent possible shortage.

DOZY, *do-zī'* or *do'zĭ*, REINHART: 1820, Feb. 21—1883, June 3; b. Leyden: learned orientalist. He studied at the univ. of his native town, and applied himself to oriental studies. In 1850 he was appointed extraordinary, and, in 1857, ordinary prof. of history at Leyden. Dozen published the *Historia Abbadidarum* (1852), and editions of Marrékoshi's *History of the Almohades* (1847), of Ibn-Badrun's *Historical Commentary on the Poem of Ibn-Abdun* (1848), and of Ibn-Adhari's *History of Africa and Spain* (1848–52). In 1849 appeared his masterly performance, *Recherches sur l'Histoire politique et littéraire de l'Espagne pendant le Moyen Age*. A second edition, enlarged and completely recast, was published 1860. In this work, Dozy has exposed the gross and wilful corruptions of the monkish chroniclers, who persisted in needlessly falsifying history for the benefit of Christianity, and who could

form no more rational idea of the Moors than that they were 'devils,' or abetted by the devil, and sent to torment the Spaniards because of their *sins*. Other valuable productions of Dozy are his *Al-Makkarī, Analectes sur l'Histoire et la Littérature des Arabes d' Espagne* (Leyd. 1855–61); *Histoire des Musulmans d'Espagne jusqu'á ta Conquête de l' Andalousie par les Almoravides* (Leyd. 1861); *Het Islamisme* (Harl. 1863), and *Die Israeliten zu Mekka* (1864).

DRAB, a. *drăb* [F. *drap*—from It. *drappo*, cloth—from mid. L *drappum*]: of a bluish grey color: N. a kind of thick woolen cloth of a color approaching the dry mud of a road.

DRAB, n. *drăb* [Dut. *drabbe;* Dan. *drav;* Gael. *drabh*, draff, dregs: Gael. *drabhas*, filth, dirt—from *drab*, a spot, a stain]: an untidy, dirty woman; a prostitute. DRAB'BER, n. one who associates with drabs. DRAB'BISH, a. having the character of a drab. DRABBLE, v. *drăb'l*, to cover with filth, DRABBLER, n. *naut.*, a piece of canvas laced on the bonnet of a sail, being an extension of the bonnet, as the latter is of the sail.

DRABA, n. *drā'ba:* in *bot.* Whitlow grass, genus of Crucifers, family *Alyssidæ*. The fruit is an oval or oblong silicule, compressed or with the valves slightly convex, one nerved at the base, nerved or veined upward, with many seeds.

DRABS, n. *drăbz* [Gael. *drabhas*, dregs, draff]: in *salt-works*, a kind of wooden box for holding the salt when taken out of the boiling-pan.

DRACÆNA, n. *dră-sē'nă* [Gr. *drakaina*, a she-dragon]: a genus of very fine ornamental-foliaged trees, ord. *Lĭlĭācĕæ*, whose inspissated juice is said to become a powder like dragon's blood: see DRAGON'S BLOOD.

DRACANTH: see TRAGACANTH.

DRACHENFELS, *drâ'chĕn-fĕls* ('Dragon's Rock'), mountain on the Rhine, one of the range called the *Siebengebirge;* renowned through Byron's verses commencing

> The castled crag of Drachenfels
> Frowns o'er the wide and winding Rhine.

It is on the right bank of the river, about eight m. s.e. of Bonn, and has an elevation of 1,056 ft. It is of volcanic origin, consisting of lava, trachyte, and basalt. Drachenfels rises abruptly from the river, and is covered with brushwood almost to the top, whence the prospect is magnificent, extending down the river as far as Cologne, and having a charming foreground in Bonn, with its university, and numerous villages, and time-worn castles. The cave where the legendary dragon—from which the mountain takes its name—was wont to abide, is pointed out to the traveller. The ruins of an old castle crown the summit and add picturesqueness to the Drachenfels.

DRACHM, n. *drăm* [Gr. *drachmē*, an anc. coin, about $9\frac{3}{4}d.$: L. *drachma*]: the eighth part of an ounce; three scruples; a weight used by apothecaries—usually written

DRAM, which see.—The *drachma* was a silver coin, the unit of the money-system in ancient Greece. It varied in value in different parts of Greece and at different times. The Attic drachma is estimated as equivalent to $9\frac{3}{4}$ *d.* sterling, very nearly a French franc. The Æginetan drachma was considerably more. But whatever its absolute worth, it always remained the 6,000th part of the *talent* (about £244, or $1,188.28) and the 100th part of the *mina* (about £4, or $19,00) and was divided into six obols. There were also coins of two, three, and four drachmas. The drachma (originally *a handful*) was also the name of a weight, and 100 drachmas made a mina, in weight, as in money. The weight of the drachma is stated at from $\frac{1}{4}$ oz. avoirdupois to little more than half as much. At this lowest estimate, the mina = 1 lb. nearly. The unit in the monetary system of modern Greece, since 1833, has also been called *drachma;* it is equivalent to $\frac{88}{100}$ of a franc, or about $8\frac{1}{2}$ *d.* sterling (abt. 17 cents) and is divided into 100 lepta. In the British system of weights there were, till recently, two drachms or drams: the avoirdupois *dram* —equal to $27\frac{11}{32}$ troy grains—and the apothecaries' *dram* (not now used), equal to 60 troy grains, or $\frac{1}{8}$ of an ounce troy. It is this last which is the representative of the ancient drachma.

DRACH'MAN, BERNARD, American rabbi: b. New York, 1861, June 27. He was educated at Columbia University and the University of Breslau and has been professor of biblical exegesis and Hebrew philosophy in the Jewish Theological Seminary of New York from 1887, and rabbi of the congregation Zichon Ephraim in that city from 1889. He is a staunch supporter of orthodox Judaism and is the author of *The Place and Importance of Jehuda Hajjug in the History of Hebrew Grammar* (1885), and *From the Heart of Israel* (1905).

DRACINA, n. *dra-sī'na*, or DRACINE, n. *drā'sĭn* [Gr. *drakaina*, a she-dragon]: in *chem.*, the resin obtained on the addition of sulphuric or hydrochloric acid to a solution of dragon's blood in alcohol.

DRACO [Gr. *drakon*, a dragon]: a kind of luminous exhalation, or *ignis fatuus*, arising from marshy places.

DRACO, *drā'kō* [Gr. *Drakon*]: Athenian lawgiver and archon, who, B.C. 624, was appointed to draw up new laws for the disordered state. These, however, effected little change in the form of the state; but by being committed to writing, put an end to the arbitrary administration of justice on the part of the archons, and resulted in the establishment of a court of appeal—that of the Ephetæ. Draco's legislation had a beneficial and permanent effect upon the political development of Athens. The extraordinary severity of these laws, however, which punished the slightest theft, or even laziness, with death, no less than sacrilege, murder, and treason, caused them to be often neglected, and made them so hated, that Solon was appointed to draw a new code. Solon, though he softened

their severity in most instances, retained that law which punished a murderer with death. Draco, at a later period, went to Ægina, where, after having introduced his laws, he is said to have been stifled in the theatre by the garments thrown upon him as a mark of respect by the people. The severity of his laws gave rise to a pun by Herodicus, who declared that Draco's laws were those of a dragon (Gr. *drakon*) and not of a man. Hence also originated the metaphorical remark of Demades, 'that they were written not in ink but in blood.' DRACONIAN, a *drā-kō'nĭ-ăn*, or DRACON'IC, *-kŏn'ĭk*, pertaining to Draco or his laws; mercilessly severe.

DRA'CO: constellation in the n. hemisphere. The star γ Draconis is notable as the one used in determining the co-efficient of aberration of the fixed stars. It is a bright star, nearly in the solstitial colure; consequently the minor axis of the small ellipse which its apparent place describes in the heavens, lies in the meridian at its transit. Moreover, at the two equinoxes, when its apparent place is at the extremities respectively of this minor axis, it can be observed on the meridian at one equinox about sunrise, and at the other about sunset, so that both observations, may be made without the interference of a too bright day-light. These two observations, therefore, are easily taken, and the difference in the north polar distance which they give, is the minor axis of the ellipse described by the apparent place of the stars.

DRACOCEPHALUM, n. *drā-kō-sĕf'a-lŭm* [Gr. *drakon*, a dragon; *kephale*, a head]: in *bot.*, dragon's-head; a genus of annual and perennial plants belonging to the order *Labiatæ*. *D. canariense* is the Canary balm of Gilead. The plants are odoriferous, and are natives of Europe, Asia, and America.

DRACONIDÆ, n. *drā-kŏn'ĭ-dē* [L. *draco*, a dragon, and adj. suff. *idæ*]: in *zool.*, in some classifications, a family of lizards, type Draco. It is generally, however, merged in the *Agamidæ*. DRACONINÆ, n. *dra-kŏn-ī'nē*, sub-family of *Agamidæ*, type Draco.

DRACO'NINE: see DRACINA.

DRACONTIUM, *dra-kŏn'shĭ-ŭm:* genus of plants of the nat. ord. *Araceæ*, of which one species, *D. polyphyllum*, native of Guiana, Surinam, also of India and Japan, has a powerful action on the nervous system, and is useful in asthma; though at present its chief reputation is the doubtful one of curing the bite of a snake, to which its mottled stem gives it some resemblance. The flower, when it first expands, emits an intolerable stench: see DRAGON, GREEN.

DRACUNCULEÆ, n. *drā-kŭng-kū'le-ē* [L. *dracunculus*, and adj. suff. *cæ*.]: in *bot.*, a tribe of *Araceæ;* stamens and pistils numerous, with the rudimentary organs interposed; spadix naked at the extremity; cells of the anthers larger than the connective.

DRACUNCULUS (plant): see DRACONTIUM.

DRACUNCULUS, (fish): see DRAGONET.

DRAFF, n. *drăf* [AS. and Dut. *drabbe;* Dan. *drav;* Icel. *dräf*, dregs, husks: Gael. *drabh*, grains of malt after brewing: the refuse malt after the liquor has been drawn off, used for the feeding of cows and swine; dregs; sweepings. DRAF'FY, a. *-fĭ*, or DRAF'FISH, a. *-fĭsh*, worthless; dreggy.

DRAFT, n. *drăft* [corrupted from *draught*, *drag*, or *draw—lit.*, that which is drawn]: a body of men taken or drawn from an army or any part of it, or from a district; a detachment of soldiers; a check or order on a bank or other debtor for money; a bill of exchange; a sketch; an outline or plan on paper; depth of water requisite to float a vessel (see DRAUGHT); tentative copy of a legal document, or other formal writing, made for the purpose of adjusting the matter afterward to be admitted into the fair copy, or engrossed, as it is called; in *hydraul. engin.*, the combined sectional area of the openings in a turbine water-wheel; or the area of opening of the sluice-gate of a fore-bay: V. to draw men from a body of soldiers for service elsewhere; to select or detach; to draw out a rough sketch of a written document; to draw out and write, as a legal document; to draw out or delineate. DRAFT'ING imp. DRAFT'ED, pp.

DRAFTS, n.: see DRAUGHT.

DRAFTSMAN, n.: same as DRAUGHTSMAN, which see.

DRAG, v. *drăg* [AS. *dragan;* Icel. *draga*, to drag or draw Dut. *draghen;* Ger. *tragen.* to carry]: to draw along heavily or slowly; to pull by main force; to pull forcibly or roughly; to draw a body along at the bottom, as of a river or other water; to hang so low as to trail on the ground: N. some thing drawn along the ground to impede or catch; an apparatus for searching in water for drowned persons, etc., an instrument for retarding the motion of carriage-wheels when going down-hill; anything that retards or hinders; an obstacle to progress; a kind of cart drawn by the hand; a kind of heavy coach; a rough heavy sledge, as a *stone drag;* in *agri.*, a heavy kind of harrow; *naut.*, a floating anchor, usually a frame of spars and sails, to keep a ship's head to the wind, and lessen the speed of drifting, called *drag anchor* and *drag sheet;* a four-horse vehicle used by sporting characters; in *mold.*, the bottom part of a mold, as distinguished from the cope; in *marine engin.*, the difference between the speed of a screw-ship under sail, and that of the screw when the ship outruns the latter; the difference between the propulsive effects of the different floats of a paddle-wheel; in *fishery*, a frame of iron with an attached net to scrape up and gather oysters by dragging upon the bed; in *mus.*, an ornament consisting of descending notes in lute music; a rallentando. DRAG'GING, imp. DRAGGED, pp. *drăgd.* DRAG BAR, n. in *railroad engin.*, strong iron rod with eye-holes at each end, connecting a locomotive-engine and tender by means of the drag-bolt and drag-spring. DRAG-BOLT, n. the strong removable bolt coupling the drag-bar of a locomotive engine and tender. DRAG-

HUNT, n. name given to a hunt when the trail has been prepared beforehand along a certain course, by means of dragging a herring or other strongly scented substance over the line. DRAG-LINK, n. link for connecting the cranks of two shafts; it is used in marine engines for connecting the crank on the main-shaft to that on the inner paddle shaft. DRAG-SAW, n. a cross cut sawing-machine in which the effective stroke is on the pull motion, not the thrust. DRAG-STAFF, n., a pole pivoted to the hind axle and trailing behind a wagon or cart in ascending a hill or slope; used to hold the vehicle from rolling backward when temporarily stopping on a hill to rest the team. To DRAG AN ANCHOR, to trail it along the bottom when the anchor will not hold the ship. DRAG-NET, a net to be drawn along the bottom of a river or pond.—SYN. of 'drag,v.': to pull; draw; haul; tug; pluck; harrow.

DRAG: mechanical contrivance for retarding motion; formerly used on team wagons, coaches, and private carriages; made in the form of an open shoe, which, when in use, was placed in front of one of the rear wheels causing it to slide upon the ground, thus retarding the progress of the vehicle and enabling the horses to go more easily and safely down steep hills. A brake, affecting both the rear wheels and by means of a lever easily and instantly applied by the driver without leaving his seat, has almost entirely superseded this inconvenient arrangement.

DRAG, in Agriculture: a harrow, consisting of a very heavy wooden frame, usually triangular, with long, large, and pointed iron teeth, or tines; used for breaking up the clods and pulverizing and leveling the surface of plowed fields. It dates from an early period, and is one of the rudest implements of its class. Was formerly in extensive use in England and Scotland, also in this country until toward the middle of the present century. It is still occasionally employed in preparing for cultivation land recently cleared of forests and in working very rough fields and heavy soils. It is not suitable for light lands or for covering seeds, and wherever used needs to be followed by a harrow with smaller teeth. The drag is unwieldy to handle, is very slow in operation, requires a powerful team, and is far less efficient than the lighter, and more scientifically constructed modern implements which have almost wholly taken its place.

DRAGANTINE, n. *dra-găn'tĭn:* a mucilage made from gum-tragacanth: see TRAGACANTH.

DRAGGLE, v. *drăg'l* [same as *drabble:* Scot. *draglit*, soiled, bespattered: Sw. *dragla*, to drivel, to let spittle fall from the mouth: used as a frequentative of DRAG]: to wet and soil by drawing along wet muddy ground or wet grass. DRAG'GLING, imp. DRAGGLED, pp. *drăg'ld:* ADJ. soiled by being drawn over mud. DRAGGLE-TAILED, slatternly, as one who drags the skirt of her gown through the mire; untidy.

DRAGO DOCTRINE. See Calvo Doctrine.

DRAGOMAN, n. *drăg′ŏ-măn*, DRAG′OMANS, n. plu. [F. and Sp. *dragoman;* Ar. *tardjumân*, a dragoman: Chald. *targêm*, to explain; *targûm*, explanation, interpretation—probably this word was introduced from Constantinople by the Crusaders, borrowed from the mediæval Greek word *dragou′manos*, an interpreter]: interpreter in Turkey, and other eastern lands, or a guide to foreigners. The common dragoman corresponds exactly to the Italian *cicerone*, or the French *commissionaire* or *valet de place*. There are several connected with hotels at Constantinople and other Turkish cities, who eagerly address European travellers, offering to perform every imaginable service. The diplomatic dragomans are, however, important personages, being the medium of communication between the Christian ambassadors and the Sublime Porte. Though usually natives, they and their families have the privilege of being under the protection of the embassy that they serve, and are subject to the laws of the country of that embassy, and not to the Turkish law. This privilege, which pertains also to all the subjects of the great Christian powers resident in Constantinople, etc., is much valued, on account of the greater severity of the Turkish laws, and the summary manner in which they are executed. These dragomans are mostly of Italian extraction, either descendants of the old Genoese and Venetian merchants or Maltese. Strange stories are told of their tricks in garbling the communications that they have to make, when private interests can be served by such means, and bribes obtained; and there is no doubt that newly appointed consuls, quite ignorant of the Turkish language, are in some respects almost completely in their power, and that this power is frequently used unscrupulously.

DRAGON, n. *drăg′ŏn* [F. *dragon*—from Gr. *drakōn;* L. *drăcōnem*, a serpent—from Gr. *drakein*, to see, to flash—from its supposed sharpness of sight: comp. gael. *drag*, fire, a fiery meteor]: a fabulous winged creature vomiting fire; a genus of reptiles of the E. Indies; a constellation; in *Scot.*, a paper kite; a serpent; in *Scrip.*, the devil. DRAGON, n. *milit.*, a short musket hooked to a swivel attached to a soldier's belt; so called, according to Meyrick, from a representation of that monster's head at the muzzle (the old fable being that the dragon spouted fire). The soldiers who carried these arms were thence called dragoons (q.v.). DRAG′ONISH, a. *-nĭsh* or, DRAGON-LIKE, in the form of a dragon; like a dragon. DRAG′ONET, n. *-ŏ-nĕt*, a little dragon; a small kind of sea-fish. DRAGONNADE: see DRAGON.—DRAGON-SHELL, n. *conchol.*, name given to a species of patella or limpet, *Cypræ stolida*. DRAGON'S-SKIN, a familiar name among miners and quarrymen for certain fossil stems whose leaf-scars somewhat resemble the scales of reptiles. DRAGON'S-TEETH, matters which cause, or may cause, civil strife—in allusion to the dragon's teeth sown by Cadmus, which produced men who killed one another, only five men remaining. DRAGON'S HEAD AND TAIL, in *astron.*, the nodes of the planets, or the two

points in which the orbits of the planets intercept the ecliptic.

DRAG'ON: name applied in modern nat. history, both popularly and by scientific authors, to different kinds of saurian reptiles. Some of these (the genus *Draco* of Linnæus) are remarkably characterized by false ribs extending from the sides, so as to support a membrane which is used as a parachute. These are called flying dragons (q.v.) or flying lizards. Another reptile which has received the name dragon, and is called also DRAGON LIZARD (*Ada*), belongs to a family of saurians, *Teyidæ*, found only in America, closely allied to the *Varanidæ* of the Old World, and to which, in common with them, the names MONITOR and SAFEGUARD have sometimes been given, in consequence of their being supposed—though erroneously—to give warning by a hiss of the proximity of a crocodile or alligator. It inhabits the marshy plains of Guiana, climbs trees with facility, bites severely, has a long compressed tail, the back and tail crested, the tongue forked like that of a serpent, and attains a length of about 6 ft. Both its flesh and eggs are used as food.

DRAG'ON: in the mythical history and legendary poetry of almost every nation, the emblem of the destructive and anarchic principle, as it manifests itself in the earlier stages of society—specially as misdirected physical power and untamable animal passion. Like the serpent, the dragon is always a minister of evil, of the principle which aims at negation, opposition, and contradiction, the object of which is to fight against order, harmony, and progress. But while the serpent seeks the attainment of its object by cunning and deceitful artifices—crawling on its belly, and always assuming ostensibly characteristics opposite to its own—the dragon proceeds openly, running on its feet, with expanded wings, and head and tail erect, violently and ruthlessly outraging decency and propriety, spouting fire and fury from both mouth and tail, and wasting and devastating the whole land. The destruction of the disorderly element thus symbolized was one of the first objects of human energy, but it was an object unattainable by merely human means, and mankind were accordingly indebted for its accomplishment to that intermediate class of beings known in classical antiquity as heroes. As the highest ideal of human strength and courage, the task properly fell to Hercules; but it was not confined to him, for we find both Apollo and Perseus represented as dragon-slayers. From legendary poetry, the dragon passed into art, some of the earliest efforts of which probably consisted in depicting it on the shield, or carving it for the crest of a conqueror's helmet. The Dragon does not seem to have been a native emblem with the Romans, and when they ultimately adopted it as a sort of subordinate symbol, the eagle still holding the first place, it seems to have been in consequence of their intercourse with nations either of Pelasgic or Teutonic race. Among all the new

races which overran Europe at the close of the classical period, the dragon seems to have occupied nearly the same place that it held in the earlier stages of Greek life. In the *Nibelungen Lied*, we find Siegfried killing a dragon at Worms; and the contest of Beowulf (q.v.), first with the monster Grendel, and then with the dragon forms the principal incident in the curious epic which bears the name of the former. Thor himself was a slayer of dragons (J. Grimm, *Deutsche Mythologie*, ii. 653). Among the Teutonic tribes which settled in England, it was from the first depicted on their shields and banners; and Dr. Plott, in his History of Oxfordshire, ascribes the origin of the very ancient custom of carrying the dragon in procession at Burford, in great jollity, on Midsummer Eve., to the fact of a banner adorned with a golden dragon having been taken by a king of the W. Saxons from a king of Mercia. The custom, however, is said by Brand, on the authority of Aubanus, to have prevailed in Germany, and was probably common in other parts of England (Brand's *Pop. Antiq.* i. 321). Nor was the dragon peculiar to the Teutonic races. Among the Celts, it was the emblem of sovereignty, and as such borne as the sovereign's crest. Mr. Tennyson's *Idylls* have made every one familiar with 'the dragon of the Great Pendragonship,' blazing on Arthur's helmet, as he rode forth to his last battle, and 'making all the night a stream of fire.'

The fiery dragon, or drake, and the flying dragon in the air, were meteoric phenomena, of which we have frequent accounts in old books, and indeed, as Brand remarks, 'the dragon is one of those shapes which fear has created to itself,' and which appears in circumstances, and clothes itself in forms, as various as our fears.

In Christian art, the dragon is the personification of godlessness and the evil power, the usual form given it being that of a winged crocodile. It is often represented as crushed under the feet of saints and martyrs, and other holy personages. Sometimes its prostrate attitude signifies the triumph of Christianity over paganism, as in pictures of St. George and St. Sylvester; or over heresy and schism, as when it was adopted as the emblem of the Knights of the order of the Dragon in Hungary, which was instituted for the purpose of contending against the adherents of John Huss and Jerome of Prague.

The dragon is often employed in heraldry; and other animals, such as the lion, are sometimes represented with the hinder parts resembling dragons. An animal so represented is said to *dragonné:* see GRIFFIN. A dragon without wings is called a lindworm, or lintworm, which Grimm (*Deutsche Mythol.* II. 652) explains to mean a beautiful or shining worm..

DRAG'ON, GREEN (*Dracunculus vulgaris*): plant of the nat. ord. *Araceæ*, which receives its name from its spotted stem; native of the south of Europe. Its flowers are black, remarkably fetid, and give out exhalations which cause headache, giddiness, and vomiting. The root is emetic,

and, probably for no better reason than the peculiar appearance of the stem, has been supposed useful for curing serpent-bites. See DRACONTIUM.

DRAGONET, *drăg'on-ĕt* (*Callionymus*): genus of fishes of the Goby (q.v.) family (*Gobiadæ*), remarkable for having the gill-openings reduced to a small hole on each side of the nape, and the ventral fins placed under the throat, separate, and larger than the pectorals. They have no air-bladder. The species are numerous; most of them finely colored, as the GEMMEOUS DRAGONET (*C. lyra*) of the British coasts—called *Gowdie* (*gowd*, gold) in Scotland—a fish 10 or 12 inches long, the prevailing yellow color of which is varied with spots of sapphirine blue, etc.

DRAG'ON-FLY (*Libellula*): a Linnæan genus of neuropterous insects, now constituting the family *Libellulidæ*. They are in general very beautiful, rivalling butterflies in their hues, and like them loving the sunshine. They are, however, easily distinguished from butterflies, even at a distance, by their more slender form and comparatively narrow gauze like wings; and differ from them still more widely in their habits, as they do not feed on the nectar of flowers, but prey on other insects, which they pursue with rapid flight. Dragon-flies have a large head; the mouth is formed for mastication, and its parts, especially the mandibles, possess great strength. The antennæ are short, awl-shaped, and of few joints. The eyes are large, lateral, and projecting. The wings—four in number—are equal in size, or nearly so, long, very thin, and very much reticulated. The legs are short. The abdomen in some is compressed, in others slender and cylindrical, in some remarkable for its extreme slenderness. The French name *demoiselle*, given to these insects, seems due to their beauty. They are remarkable equally for their voracity. The Great Dragon (*Aeshna grandis*), an insect about four inches long, largest British species, has been seen to dart upon a large cabbage-butterfly which passed as it was flitting up and down in search of prey; and then, settling on a twig, it bit off the wings, and in less than a minute devoured the body.

Dragon-flies are usually most abundant in the vicinity of lakes, rivers, and marshes. They deposit their eggs in water, and the larvæ and pupæ are entirely aquatic, living chiefly at the bottom of the water, and creeping on the submerged parts of aquatic plants. They are as ravenous as the perfect insect, which in general form they resemble; aquatic insects are their food. The pupæ, unlike those of the greater number of insects, are active. They are provided with the means of drawing water into their bodies to supply air for respiration, and expel it again by the same orifice at the extremity of the abdomen, with such force, that they thus propel themselves through the water, while their legs are at rest. When the final transformation is about to take place, the Dragon-fly pupa crawls out of the water on a stick, rush, or other object; fixes itself by hooks, with which its legs are furnished; and the skin then splitting at the back, the perfect insect comes forth,

but with body and wings quite soft and moist, and the wings still folded up into small compass. In the subfamily *Agrioninæ*, the wings are vertical in repose; different species are red, blue, green, etc. In the *Aeschninæ*, common Amer. species are *L. trimaculata*, and *quadrimaculata*, named from smoky wing spots. *Aeschna heros* is very large, the body green-striped.

DRAGONNÉE, a. *drăg-gŏn'nā* [F.]: in *her.*, a term applied to a lion or other beast when the upper part resembles a lion and the under part the wings and tail of a dragon.

DRAG'ON ROOT or GREEN DRAGON (*Arisæma dracontium*): American plant of ord. *Araceæ*, differing from Indian Turnip (*A. triphyllum*), in 7-11 divided leaf, the root of which, and perhaps of this, was used to stimulate secretions in chronic ills. The powder, made into paste with honey, was sometimes applied to the mouths and throats of children in aphthæ; and milk, in which the root has been boiled, was used as an ointment for scald-head, ringworm, etc.

DRAG'ON'S BLOOD, (called sometimes Gum Dragon): astringent, resinous substance, obtained from several trees of different nat. orders, natives of warm countries. The greater part of the Dragon's Blood of commerce is probably the produce of *Pterocarpus Draco*, a large S. American tree of the nat. ord. *Leguminosæ*, sub-order *Papilionaceæ*, which at some seasons appears as a magnificent mass of yellow bloom. Dragon's Blood is also obtained from the *Calamus draco*, a palm of the East Indies; from a *Dalbergia* in Guiana, and a *Croton* in South America; and from the Dragon Tree, *Dracæna draco* (order *Liliaceæ*), which is most celebrated in connection with the Canary Islands. A historic tree of this last species, at Orotava, acquired enormous dimensions, and was visited and celebrated by almost every traveler, including Humboldt, but was destroyed by a storm in 1867. The stem of the dragon tree is generally short in proportion to its thickness, and its head consists of numerous short branches, terminating in tufts of sword-shaped leaves.

Dragon's Blood is opaque, of deep reddish-brown color, brittle, smooth, with a shining shell-like fracture, and when burned, emits an odor resembling that of benzoin. It is nearly insoluble in water, but is soluble in alcohol, and the solution will permanently stain heated marble, for which it is often used, as well as for staining leather and wood. It is also soluble in oils and turpentines, and enters into the composition of brilliant and much-esteemed varnishes. It was used formerly in medicine, but is now almost out of use. An astringent resin obtained from the *Eucalyptus resinifera* of Australia is there called Dragon's Blood.

DRAG'ON'S MOUTH (or, in Spanish, BOCA DEL DRAGE): strait in S. America separating Trinidad from the mainland, and connecting the Gulf of Paria with the s. e. extremity of the Caribbean Sea.

Dragon's Mouth: name also of a strait in Central America, on the n. e. coast of Veragua, the most n. w. portion of New Granada, and it communicates between the Caribbean Sea and Lake Chiriqui.

DRAGOON, n. *drăg-gôn'* [OE. *dragon*, a species of carbine used by soldiers, who could serve on horseback or on foot: F. and Sp. *dragon*, a dragon, a horse soldier—from L. *dracōnem*, a dragoon (see Dragon)]. a horse soldier, originally trained to act on foot also; a cavalry soldier. V. to force; to harass; to persecute; to use violent measures to obtain an object. Dragooning, imp. Dragooned, pp. *-gônd'*. Dragoonade, n. *drăg'û-nād*, also Dragonnade, n. *drăg'-ŏn-nād'*, the giving up a place to the violence of soldiers; applied particularly to the merciless persecutions instituted under Louis XIV. and his successor against the French Protestants to compel their conversion. The Dragonnades consisted of armed expeditions, led by a bishop, an intendant a sub-delegate, or a priest, who marched through the provinces, demanding of the heretics that they should abjure their faith, and leaving such as were refractory to be dealt with by the unscrupulous troops. Foremost among the armed force rode dragoons, who, from the fact of their taking the precedence, and from the merciless treatment to which they subjected the Protestants, had the unenviable honor of giving a name to the persecutions. Louis XIV., who had been entirely misinformed as to the means employed in the dragoon by the courtiers and fanatics who surrounded his throne, was delighted to find that from 250 to 400 Protestants were daily being received into the bosom of the church, and in consequence, 1685, Oct. 22, a few months after the date of the first of the dragoon, he revoked the Edict of Nantes (q.v.), that the good work might be completed.

DRAGOON', in Military: cavalry soldier. From the old fable that the dragon spouts fire, the head of the monster was worked upon the muzzles of a peculiar kind of short musket carried first by the horsemen raised by Marshal Brissac, 1600. This gave these soldiers the name of dragoons; and from the general adoption of the same weapon, though without the emblem in question, the term gradually extended itself till it became almost synonymous with horse-soldier. Dragoons were originally a kind of mounted infantry, drilled to perform the services both of horse and foot. At present, *dragoon* is one among many designations for cavalry, not precise in its application.

In the British army, the *heavy* dragoons and the *light* dragoons are carefully distinguished in regard to the weight of the men, horses, and appointments. The first dragoons in the army were the Scots Greys, established 1683. In the British army, there are at present 10 regts. of Dragoons: see Horse Guards. In the U. S. milit. service the term is not in use.

DRAGUIGNAN, *drâ-ghēn-yŏng':* town of France, dept. of Var, on a tributary of the Argens, about 40 m. n.e. of

Toulon. It is charmingly situated, in a valley with the slopes of the surrounding hills covered with vineyards and olive plantations. It is moderately well built; and its streets are adorned with numerous fountains and trees. Its principal structures are the prison, the court-house, a hospital, and a stately clock-tower. It has manufactures of coarse woolens, leather, hosiery, silks, soap, brandy, oil, and earthenware. Draguignan is an ancient place. During the middle ages it was strongly fortified. The fortifications were destroyed in the civil wars, but were reconstructed 1615. Pop. 9,816.

DRAIN, v. *drān* [AS. *drehnigean*, to strain: O.H.G. *drahan*, a drop, a tear: Gael. *druigh*, to soak or ooze through; prov. Sw. *dradda* to drop]: to make dry by drawing off the water gradually; to flow off gradually; to free from water gradually; to empty; to exhaust; to be freed from moisture: N. a channel, trench, or ditch for conveying water; a sink or small sewer; a gutter. DRAIN'ING, imp. DRAINED, pp. *drānd*. DRAIN'ER, n. he who, or that which. DRAIN'ABLE, a. *-ă-bl*, capable of being cleared of water or surplus moisture. DRAIN'AGE, n. *-āj*, the act of draining; that which flows out of a drain; the mode of carrying off the surface-water of a country, as by rivers, etc. DRAIN-TRAP, n. a device for allowing water to pass off without admitting the passage of air through the duct; also called *stench-trap*. DRAINING-AUGER, n. a horizontal auger occasionally used for boring through a bank to form a channel for water. It is also used for cutting an opening for laying lead-pipe or drain-pipe. In each case it is intended to save the labor of opening a trench. It is also used for draining marl-pits or cellars when the circumstances of the level suit. DRAINING-PLOW, n. a ditching-plow. DRAINING-PUMP, n. a pump (*pompe castraise*) for elevating water containing sand and gravel. DRAINING-TILES, n. tiles used in the draining of fields. DRAIN-WELL, n. a pit sunk through an impervious stratum of earth to reach a pervious stratum and form a means of drainage for surface-water.

DRAINAGE, in Agriculture: art of removing an excess of water from the land. Various processes, differing widely in cost and in the value of the results obtained, are in common use.

The simplest method, the one first devised and always adopted in newly settled countries, is the open ditch (see DITCH). Covered ditches, or underdrains as they are commonly called, are far superior and are largely used wherever agriculture has made much progress. The ancient Romans made many open trenches and constructed underground drains to some extent. In 1652, Captain Walter Blythe, of England, published a book in which he recommended the cutting of deep trenches and partially filling them with stones for the drainage of bogs; but his method was not generally adopted. In 1763, an English farmer named Elkington discovered a way of draining certain soils by boring through the clay subsoil until the spring which caused the trouble was reached, and carrying off the

water in open ditches. At the recommendation of the board of agriculture, parliament granted him £1,000 for the introduction of this system of improving lands. About 1836, William Smith developed a method applicable to all wet soils and thoroughly effective. He cut deep trenches which he partially filled with stones and then covered with earth, as had been previously recommended, and by making these drains parallel to each other secured their uniform and efficient action. In 1843, drain pipes, or tiles, were introduced, and a practical method of making continuous and permanent drains at a moderate expense was perfected. Three years later, parliament passed an act designed to assist landholders in draining their estates, and has since aided them in carrying out improvements in this line. In the United States, owing to the abundance of land and the low price for which it could be obtained, systematic drainage was not attempted until a later period and has never become general.

Drainage of wet fields not only acts beneficially by carrying off the surface water in heavy rains, but is equally useful in permanently lowering the level at which water stands in the land. Thus it deepens the soil and allows the roots of plants to penetrate it farther and obtain stores of nourishment otherwise unavailable. It also cuts off the supplies, often very great, of water which rises from below, and which, having lost by filtration the fertilizing element which it brought from the atmosphere, as well as much of its warmth, is far less beneficial to plants than water directly from the clouds. Drainage prolongs the season during which land can be cultivated. Planting can be done earlier and the season of growth is carried later into the autumn. On drained land, crops can be cultivated during wet periods between planting and harvesting, while on undrained soils they must, at such times, be left to shift for themselves. Another advantage is found in the increased warmth of drained land. Careful observation has shown that a thoroughly drained soil is 10 to 15 degrees warmer at a depth of seven inches than the adjacent undrained fields. Drainage also permits better tillage than would otherwise be possible. Thorough pulverization, which is absolutely indispensable to the rapid growth and fullest development of plants, cannot be effected in wet soil. By making the soil more porous, drainage largely increases its power of absorbing moisture from the air, and thus tends to prevent injury to crops from drought, as well as from a superabundance of water. By allowing the water to percolate through the soil, drainage prevents the destruction of grain crops by 'winter-killing' and also the washing away of fertilizers which have been spread upon the surface. By admitting air and rain-water to the roots of plants, it aids in the preparation of organic and inorganic matters for their food, and facilitates the passage of the essential elements of manures and fertilizers to a position in which they can be utilized. It benefits plants by insuring quicker

germination of the seed, more vigorous growth, earlier maturity, and greater productiveness. The removal of stagnant water from a large area also causes important climatic changes and promotes the health of the inhabitants. This is seen in the decrease of fevers and kindred diseases where wet lands have been thoroughly drained. Various diseases of animals also are frequent on wet lands, which disappear when drainage is effected; while insect pests, as flies and mosquitoes, are far more common in wet than in dry localities.

Lands resting upon a porous subsoil do not require artificial drainage, as the surplus water will readily pass below the point at which it would prove detrimental to plants. But where the subsoil is hard drainage is required, and the land cannot be permanently and profitably improved while this is neglected. All lands which at any season of the year hold an excess of water are sure to be immediately and permanently benefited by drainage.

Of the different methods of drainage, besides the open ditch, furrow-draining, which consists in plowing the land in ridges upon which the planting is to be done and leaving large furrows for holding the water, was formerly employed, but has been generally discarded. For underdraining, which is far superior to open drains of any form, the mole plow has been used for opening a channel in clay soils, but will not work where there are stones or much variation in the character of the subsoil. No permanent benefit can be derived from its use. Plank drains, made by placing planks on edge at each side of a trench, laying a plank on top and covering with earth, last some years. Trenches partially filled with brush or turf are of no permanent value. Stone drains are far better than any of the preceding. A deep and wide trench, with very sloping sides is partially filled with small stones over which large flat stones are laid. The remainder of the trench is then filled with earth thrown out when it was dug. On account of the much larger trench required and the labor of handling the stones this form of drain is more costly than tile, but is neither as durable nor as efficient. Tile drains are by far the best of any yet devised. Tiles are made of clay which is burned like brick and if properly laid will last for generations. They are made in various forms, of which the cylindrical is the most common as well as the best and most convenient. The joints are protected by collars, though some tiles are made with one end larger than the other, the small end of one being put into the large end of the next, so that a continuous pipe is formed Water enters at the joints and except where glazed tiles are used, through pores in the pipe.

The lowest point in the field should be chosen for an outlet. From this the main drain should be run up the slope. Lateral drains, running parallel with each other, should enter the main at right angles. The tiles must be laid at a regular grade, without regard to inequalities in the surface of the land. There should be a fall of at least four

inches in every 100 ft., and twelve inches would be much better, though it is claimed that drains with a grade of less than two inches per hundred ft. have been successful. In large fields, or in those which slope in different directions, more than one system of mains and laterals may be required. The distance apart at which drains should be placed varies with the character of the land and the quantity of water. From 30 to 40 ft. will be proper for most soils. The depth of drains is an important point. In wet land, the level of the drain will also be the level of the stagnant water below which the roots of cultivated plants will not penetrate. Where drains are deeply laid the water is more perfectly filtered than it can be where they are shallow and the loss of valuable fertilizing matter is avoided. Four ft. may be considered a fair depth, though five ft. is decidedly better. The size of tiles required varies with the fall and the quantity of water to be removed. Probably mains from three to six inches and laterals from one and a half to two inches in diameter are most frequently used.

In all its details the work of drainage should be performed in the best possible manner. The cost involved will depend upon the character of the land, the degree of fall, the methods adopted, and the materials employed. It is safe to say that no other line of farm improvement makes such prompt, liberal and permanent returns for the expense incurred, and at the same time so largely increases the cash value of the property itself, as the thorough drainage of wet and retentive soils.

DRAIN'AGE-TUBES, in Surgery: important addition to surgical appliances; introduced by a Fr. surgeon, Chassaignac. They are of india-rubber, from $\frac{1}{8}$th to $\frac{3}{8}$th inch in diameter, perforated with numerous holes, and of various lengths. They are useful especially in chronic abscesses (which it may be unadvisable to empty at once); in empyema (q.v.); and in withdrawing the fluid accumulation in certain classes of abdominal tumors; also in large wounds, such as those made by amputation, and in all cases where there is apt to be deep accumulation of discharge. They are introduced in such a manner that one end is on a level with, or projects above the skin; the other is in communication with the seat of discharge; and by allowing that discharge constantly to escape from the external wound, they diminish both chemical irritation from putrid accumulation and mechanical irritation from pressure. Like all new inventions, this has its advocates and opponents.

DRAINS, n. plu. *drānz* [perhaps older form of Eng. *grains:* Sw. *dragg*, distillers' grains, dregs: Rus. *drän*, refuse (see BRAFF and DREGS)]: in *prov. Eng.* and *OE.*, the spent refuse of malt in brewing.

DRAKE, n. *drāk* [Sw. *and-drake*, a male wild duck—from *and*, a wild duck; Ger. *enterick*, a male duck—from *ente*, a duck: Icel. *reckr*, a male: Gael. *dràc*, a drake]: the male of the duck kind; name of a fly.

DRAKE, n.: name given to the silver shilling of Elizabeth from the mint mark which was commonly believed to refer to Sir Francis Drake, but really was the armorial cognizance of Sir R. Martin, Master of the Mint in 1572.

DRAKE, *drāk*, Sir Francis: abt. 1539-1595, Dec. 27; b. in a cottage on the banks of the Tavy, Devonshire, England. His father, who was a yeoman, and had 12 sons, was a zealous Protestant, and during the persecution under Queen Mary, fled from Devonshire into Kent, in which county his family was brought up. He obtained some kind of clerical appointment among the seafaring-men of the district, and in consequence, Drake's younger years were passed among sailors. Drake was at an early age apprenticed to a neighbor of his father's, who possessed a bark, and occasionally made voyages to Zealand and France. When his master died, Drake fell heir to the vessel, and carried on the old trade with considerable success. While coasting about, he heard of the exploits of Hawkins in the New World, and the recital took such a hold of his imagination, that, selling his ship, he proceeded to Plymouth, and joined Hawkins in his last expedition to the Spanish Main. The adventure was disastrous to all concerned, and Drake came home much poorer than when he set out. Undismayed, however, he gathered around him wild and reckless spirits, and having raised sufficient money, they fitted out a vessel, and under the command of Drake made several voyages to the West Indies. In 1570, he obtained a commission from Queen Elizabeth, and cruised in the W. Indies, enriching himself with plunder. In 1572, he sailed again for the Spanish Main, and, assisted by some other English ships, he plundered the town of Nombre de Dios. He then crossed the Isthmus of Darien, and beholding the Pacific, prayed God to grant him leave to sail an English ship in that sea. On Sunday 1573, Aug. 9, he came into Plymouth laden with spoil; and when the news spread of his arrival, the people forsook the service in church, and came out to gaze on the brave and successful sea-rover.

Under the sanction of Queen Elizabeth, Drake again set sail, 1577, taking five vessels. He sailed to S. America, and plundered the coasts. In Sep. of that year he entered the Pacific. During his voyage, he was singularly successful. He sacked the Spanish towns on the coasts of Chili and Peru, and captured a royal galleon laden with plate. He then steered for the n.e., and sailed as far as 48° n. lat., in the neighborhood of the s. end of Vancouver's Island, hoping to find a passage back to the Atlantic; but the severity of the cold discouraged his crew, and he took shelter in Port San Francisco. He stayed there several weeks, and formally took possession of the country for the queen of England, naming it New Albion. He then steered across the Pacific for the Moluccas; reaching Ternate, he sailed for Java, thence he stretched across the Indian Ocean for the Cape of Good Hope, which he doubled in safety, and arrived at Plymouth 1579, Sep. 26,

Sunday. He was graciously received at court. Elizabeth banqueted on board his vessel, and conferred on him the honor of knighthood.

During part of 1585 and the whole of 1586 Drake was employed, with a fleet of 21 ships, against Philip II. of Spain, chiefly in the W. Indies and the coasts of S. America. In this, as in his former voyages, he plundered many towns, and enriched himself with spoil. During this voyage, he visited Virginia, which colony had been recently planted by Raleigh. Thence he returned home, and it is said brought tobacco with him.

Spain was now preparing an Armada for the invasion of England, and Elizabeth sent Drake with a fleet of 30 sail to destroy the enemy's ships in their own harbors. He entered the Roads of Cadiz, passed the batteries 1587, Apr. 19, in the morning, and before night, destroyed 100 vessels, and possessed himself of immense booty. He then sailed along the coast burning and plundering. He entered the Tagus, and flouted the Marquis Santa Cruz, who was lying in that river with a large force of galleys. Having done all the mischief in his power to Spain, Drake, with that keen appetite for plunder which never forsook him, steered for the Azores, on the lookout for homeward-bound treasure-ships. He was fortunate enough to encounter a richly-laden carrack, of which he took possession. On his return, he spent a considerable portion of his prize-money in supplying the town of Plymouth with water.

Drake was next employed as vice-admiral in the fleet under Lord Howard, which scattered the Armada, and broke the naval supremacy of Spain. In 1589, he was sent to Portugal with a fleet, to expel the Spaniards, who had taken possession of that kingdom; but the expedition was unsuccessful. On his return, he was elected member of parliament for Plymouth. In 1595, with Sir John Hawkins, he was sent with a fleet to the W. Indies. In the course of the expedition, the commanders quarrelled. Hawkins died before reaching Puerto Rico. Attacking the place, Drake received a repulse. Sailing away, he burned and plundered several towns. He came to anchor in Nombre de Dios, where a deadly disease broke out among the soldiers and sailors of the fleet. Drake was at last smitten, and after struggling 20 days with the malady, he expired. On the day of his death, the fleet anchored at Puerto Bello, and there the bold sailor and buccaneer received his sea-funeral.

DRAKE, Friedrich: 1805, June 23—1882, Apr. 6; b. Pyrmont: German sculptor. He was trained under Rauch of Berlin. Among his principal works are a *Madonna with her Infant* (purchased by the empress of Russia), a *Dying soldier* a *Vintager*, *The Eight Provinces of Prussia* (colossal allegorical figures, adorning a hall in the royal palace at Berlin), and a *Warrior crowned by Victory*, reckoned one of the master-pieces of Prussian sculpture. But Drake owes his celebrity chiefly to statues,

busts, and medallions. There are few great countrymen of his of whom he has not made a marble memorial. His statues of Schinkel, the two Humboldts, Rauch, Oken, his colossal statues of Frederick-William III., and William I. at Cologne, deserve especial mention; as also the busts of Bismarck and Moltke. He was long prof. of sculpture in the acad. at Berlin.

DRAKE, Joseph Rodman: 1795, Aug. 7—1820, Sep. 21; b. New York: poet. He entered upon a mercantile career when a boy, began studying medicine when 18 years old, graduated when 20, and married a daughter of Henry Eckford, naval architect and ship-builder, when 21. He began writing verses before he was 14 years old, and when 17 became acquainted with Fitz-Greene Halleck, with whom he maintained the closest intimacy till his own death. He made a tour of Europe 1818, was associated with Halleck in anonymously contributing the 'Croaker' series of amusing verses to the *Evening Post* 1819, and spent the winter preceding his death in New Orleans seeking relief from consumption. His poems of which nearly all were written before he was twenty-one years old and several before he was 16, include *The Mocking Bird* and *The Past and Present* (1809), *The American Flag*, to which Halleck added the four last lines (1819), and in the 'Croaker' series *On Presenting the Freedom of the City in a Gold Box to a Great General, The Secret Mine Sprung at a Late Supper, to Mr. Potter the Ventriloquist, Ode to Mr. Simpson, Manager and Purveyor of the Theatre, The Battery War, to John Minshull, Esq., Poet and Playwright, Abstract of the Surgeon-General's Report, Ode to Impudence, Ode to Fortune, Ode to Simon Dewitt, Esq., Surveyor-General,* and *To Croaker, Jr.*

DRAKE, Samuel Gardner: 1798, Oct. 11—1875, June 14; b. Pittsfield, N. H.; historian. He received a common-school education, was a teacher 1818-25, and established the first antiquarian book-store in the country in Boston 1828. While collecting and selling books relating to the early history of this country, he engaged also in compiling, editing, and publishing works of rare historical value. He became one of the founders of the New England Historic-Genealogical Soc. 1847, its pres. 1858, and the editor of its quarterly *Register*. His re-publication, compilations, and original contributions to American history include *Church's Entertaining History of King Philip's War* with notes (1825), *Indian Biography* (1832), *Book of the Indians* (1833), *Old Indian Chronicle* (1836), *Indian Captivities* (1839), *Account of the Family of Drake* (1845), *Review of Savage's Edition of Winthrop's Journal* (1854), *History and Antiquities of Boston* (1856), *Result of Searches among the British Archives* (1860), *Memoir of Sir Walter Raleigh* (1862), *Introduction and Notes to Mather's Indian War of* 1675-6 (1862), *Early History of New England* (1864), *Hubbard's Indian Wars* (1865), *The Witchcraft Delusion in New England* (1866), *Annals of Witchcraft in the United States* (1869), and *History of the French and Indian War*

(1870). His son, FRANCIS SAMUEL DRAKE (1828, Feb. 22—1885, Feb. 22) compiled a *Dictionary of American Biography* (Boston 1872), and published *Memorial of the Massachusetts Society of the Cincinnati* (1873), *Life of Gen. Henry Knox* (1873), *The Town of Roxbury* (1873), *Tea-Leaves* (1884), and *Indian History for Young Folks* (1885), and edited Schoolcraft's *History of the Indians.* Another son, SAMUEL ADAMS DRAKE, became a brig.gen. in the Union army during the civil war, and has published *Hints for Emigrants to Pike's Peak* (1860), *Old Landmarks of Boston* (1872), *Old Landmarks of Middlesex* (1873), *Nooks and Corners of the New England Coast* (1875), *Heart of the White Mountains* (1881), *New England Legends* (1883), *Our Great Benefactors* (1885), and *The Making of New England* (1886).

DRAKENBERG, *drâ'kėn-bĕrch:* ridge of mountains in s. Africa, forming part of the boundary of Natal (q.v.).

DRAKE UNIVERSITY: institution of the Disciples, at Des Moines, Polk co., Iowa; founded 1881, chiefly by Francis Marion Drake, brig.gen. in the civil war, afterward a railroad-builder. The university has theological, normal, law, medical, and music schools; the number of the faculty is over 100, and the number of students nearly 2,000. It has a library of 30,000 vols. Its endowment is $225,000. A new science hall cost $30,000.

DRAM, n. *drăm* [from DRACHM, which see: comp. prov. F. *drame,* a pinch of snuff: Gael. *dramaig,* a mixture of meal and water or whisky in small quantity; It. *dramma,* a very small quantity of a thing]: a small quantity, particularly of a liquid or liquid mixture; one eighth part of an ounce apothecaries' weight; one sixteenth of an ounce avoirdupois; a small glass of spirits to be drunk at once.

DRAMA, n. *drâm'ă* or *drā'ma* [L. and Gr. *drama,* an act or deed, a play, a drama—from Gr. *drăō,* I do, I perform: F. *drame*]: a composition or species of poem in which the action or narrative is represented—not related, and fitted for representation on the stage; a play. DRAMATIC, a. *dră-măt'ĭk* or DRAMAT'ICAL, a. *-ĭ-kăl,* relating to the drama. DRAMAT'ICALLY, ad. *lĭ.* DRAMATIC CORPS, *kōr,* the whole body of actors attached to a theatre. DRAMATIS PERSONÆ, *drăm'-ă-tĭs pėr-sō'nē,* [L. *persōnæ,* persons or characters; *dramătis,* of the drama]: the actors in a drama or play represented on the stage. DRAM'ATIST, n. *-tĭst,* a writer of plays. DRAM'ATIZE, v. *-tīz,* to adapt to, or fit for, the stage. DRAM'ATI'ZING, imp. DRAM'ATIZED, pp. *-tīzd.* DRAMATIZATION, n. *dra-măt-ĭ-zā'shŭn,* the act or art of dramatizing, or describing scenes dramatically; dramaturgy. DRAM'ATUR'GY, n. *-ter'jĭ* [Gr. *ergon,* work]: the science and art of dramatic compositions and representations.

DRAMA, a Greek term meaning action, and applied to that form of literature which is suited for performance, or action, before an audience. A drama tells a story by means of speeches and dialogue, and these are to be spoken

by actors impersonating the characters and performing the actions of the story. Speech, gesture, facial expression, masks, pantomime, stage 'business,' music, dancing, scenic painting, are some of the theatrical accompaniments by means of which the dialogue has been made to imitate scenes from life. (See THEATRE.) Since mimicry is as old as the race, it is evident that there have been from times of primitive culture dramatic elements in games, sports, dances, religious ceremonies and other mimetic performances; but it is only late in the development of civilization that the drama takes an important place in literature. Nor can the use of dialogue, as in the Book of Job or in mediæval estrifs, be taken as constituting a dramatic literature. The dramatic tendencies in life and literature have resulted in the various nations in definite literary forms, given regular theatrical presentation; and it is the history of these that this article discusses.

Although in modern times dramas have frequently been written in prose, the drama in classical times was regarded as one of the three divisions of poetry, and so differentiated from epic, the narration of events, and lyric, the expression of emotion, and the same distinction is still applied in a general way to literature. Another distinction due to the Greek is the division of drama into two species, tragedy and comedy; the former dealing with the more serious themes of life and especially with suffering and death, the latter with life's follies and absurdities, fun and sentiment. This distinction was not made in Indian, Chinese, or mediæval drama, and the two species have varied in different countries and centuries; and there have always existed dramas which stand outside the strict limits of either class; as *satyric* in Greek, *morality* in the Middle Ages, *tragi-comedy* and *pastoral* in the Renaissance, *drame* in modern French, and *melodrama* at present denoting a mixed and uncritical form. Nevertheless the two species survive and remain fairly comprehensive, the commonly accepted distinction between the two depending on the presence of a happy or an unhappy ending.

The drama of India has been the object of much interest to western scholars since the translation by Sir William Jones in 1789 of 'Sakuntala,' one of the masterpieces of Kalidasa, the greatest of Sanskrit dramatists. The drama of China, of much later development, offers, like that of India, many points of difference from European drama. The earliest examples of the drama, however, are found in Greek, and with these we may begin a survey to the historical development and the general characteristics of the literary drama of Athens, Rome, the Middle Ages, and Modern Europe.

Athens—Greek drama had its origin in the dithyrambic songs chanted by the choruses who impersonated the satyr followers of Dionysius in the festivals in honor of the god. Spoken verses and dialogue were after a time introduced in the midst of the choral odes, and from this

beginning both tragedy and comedy eventually developed. To Thespis (650 B.C.) is credited the addition of the chorus of an actor to fill in with speech and mimicry the intervals of singing and dancing. He was the founder of Attic tragedy, which continued to develop rapidly during the next century. The connection of the drama with the worship of Dionysius was maintained and tragedies were performed at prize dramatic contests, instituted in honor of the god, supported by the state, and witnessed by vast concourses of citizens. No plays survive from before the time of Æschylus (b. 525 B.C.); and to him and to his immediate successors, Sophocles and Euripides in the 5th c., Attic tragedy owes its highest development and its long-continued eminence and influence in the dramatic literature of the world.

The dithyrambic chorus, originally of 50 men, was separated into four choruses of 12 or 15 each, and plays were composed in groups of four, three tragedies, sometimes forming a trilogy on one subject but later usually on disconnected themes, and a fourth satyric play, retaining the satyrs of the ancient festivals. Each play consisted of a series of passages of dialogue, interspersed by the odes of the chorus. The dialogue introduced various persons and developed a complete story, usually taken from mythology and dealing with the life of some particular hero. Not more than three actors shared in the dialogue at one time, the second actor having been introduced by Æschylus, and the third by Sophocles. The chorus occasionally took part in the dialogue, but its main function was the singing of odes with accompaniment of music and dancing. In Æschylus the chorus is of great importance, and its explanations, advice, and lamentations are essential to the representation of the action; but by the time of Euripides, its part is subordinate and its odes often have no connection with the dialogue. Although subjects were drawn from mythology, and the same story was often treated by several dramatists, large freedom was permitted in the treatment of the myths, and consequently there is development in subject matter as in form. Æschylus treats the myths as supernatural revelations and deals with the course of fate or Nemesis rather than with the conflict of human motives. Sophocles is interested in human nature and moral law, in human life rather than in the supernatural. Euripides treats the myths with free invention and in a realistic and even skeptical fashion, transforming gods and heroes into men and women of the day, delighting in situations of emotional intensity, and making the passion of love for the first time of capital importance as a dramatic motive.

The symmetry and unity of Attic tragedy were in part the result of limitations imposed by the conditions of the theatrical performance, resulting in the three unities, the value of which has been the subject of much controversy in modern times. The unity of action involved the restriction of the incidents of a play to those strictly con-

cerned with the main action; the unity of time confined the events of the action to a single day; and the unity of place to a single place. In spite of these and other restrictions already noted, the plays, though wanting the wealth of incident and the variety and surprise common to the best modern plays, are by no means lacking in human interest. Moreover, they represent the height of poetic style. The splendor and beauty of their language and the exquisite perfection of their versification as well as the power and truth of their representation of human character and deed, place them among the consummate products of the imagination. After the 5th c. tragedies continued to be numerous and popular not only in Athens but in other Greek towns; and later the plays of the great dramatists and of some of their successors were performed in Alexandria and Rome. Only fragments of later tragedy however, have survived.

Comedy, like tragedy, sprang from the worship of Dionysius, developing from the frolic and buffoonery of the harvest festival. Farces were exhibited early in the 6th c., but the first great comic writer was Aristophanes. His comedies were satirical and burlesque criticisms of the life of Athens in his day, dealing with political and intellectual tendencies, and fashionable follies, and putting no limit to direct personal satire. Socrates, for example, was caricatured in the *Clouds* and Euripides in the *Frogs*. Aristophanes, however, was a lyrical poet as well as a great humorist; and his comedies are medleys of satire, caricature, wit, humor, buffoonery, wisdom, fantasy, and poetry. This, the 'old comedy' of Athens, was followed in the 4th c. by 'middle comedy' which avoided political and personal matters, and by 'new comedy' (320–250 B.C.), the ancestor of the modern comedy of manners. The chief representative of the new comedy was Menander, whose work down to to-day survived only in fragments and in the translations and imitations of the Roman Terence, but who may be better understood if recently announced discoveries answer to the expectations raised.

Rome.—The early development of the drama in Rome seems to have been similar to that in Greece and other countries; but as no representatives of the early folk drama or the Atellan farces have survived, it is impossible to trace any peculiarities in its national development. Roman drama is, indeed, known to us only in the works of three writers, the comedies of Plautus and Terence, and the tragedies of Seneca. In this late development it is only a borrowing from the Greek. Terence, aiming at literary excellence and protesting against the coarseness and brutality of his audiences, seems to have imitated or even translated Menander without attempt at any departure. Plautus while he also followed the new comedy of the Greeks, appears to have derived some of his characteristics from the earlier Roman farces, and at all events exhibits a coarseness and directness of humor suited to his

audience and characteristic of Roman taste. These Roman comedies served as models and incentives for the dramatic writers of the Renaissance, and its stock characters and lively intrigue have had an influential existence down to the present day. In the same way the tragedies of Seneca served as models for the humanists and became the main classical influence upon modern tragedy. Probably never acted, they were rhetorical imitations of Euripides and later Greek tragic-writers, preserving in the main the form of Attic tragedy, dealing with the most sensational and bloody stories from Greek mythology, and abounding in extravagant declamation and sententious philosophizing. Still another inheritance for future ages came from the very dregs of the Roman theatre, the *Mimes*. The theatre in the later empire ceased to be the home of the drama, and was given over to bloody spectacle and indecent pantomime. Attacked violently by the early fathers, it ceased with the triumph of Christianity; but the dispersed *mimes* became the ancestors of the travelling entertainers of the middle ages, and the traditions of clownery and farce were handed down from generation to generation.

The Middle Ages.—After the destruction of the theatres by the Christians, all knowledge of the classical drama or theatre practically disappeared. An extensive and multiform drama arose without dependence on classical precedent, never in any nation attaining much literary value, but of interest to the student both as a most significant illustration of the life of long centuries and as a potent influence upon modern drama. The origins of this mediæval drama are various. Games and sports offer their share of mimetic performances, tracing back apparently as did the Dionysiac festival at Athens to early celebrations of spring and harvest; and the popular entertainers, the direct descendants of the Roman mimes, seem to have exercised an effect, not easily traceable, on comedy, especially on the *farces* and *sottises* in France. The main stream of mediæval drama, however, had its origin in the church liturgy. The church service contained many manifestly dramatic elements; and the 'offices,' especially those for Easter and Christmas, were gradually expanded into little plays that grew into the mysteries, miracles, and moralities of later times. The steps in this growth cannot be traced with chronological exactness, but the process was one of secularization, the removal of the play from the service, from the church itself, and eventually from the hands of clerical actors, and the intrusion of the vernacular and its final triumph over the Latin of the church service. The institution of the Festival of Corpus Christi (1264, confirmed 1311) gave new support to these plays, and during the 14th and 15th centuries their vogue under control of the guilds and other play organizations became enormous, in spite of the protests of the church, which began to look askance at the realistic and spectacular treatment of the holy writ.

The earliest vernacular play is the Norman *Adam* written apparently in the 12th c.; and the earliest examples of *Miracles* date in the 13th. The typical *Miracle* was a dramatic adaptation of a saint's life with the intercession of the Virgin on behalf of the suffering saint. In French drama, the miracles are to be distinguished from the *Mysteries*, which dealt with stories from the Bible and which ran to inordinate length, the entire Bible history being treated in a cycle of short scenes. These cycles in France were huge conglomerates, that of the Acts of the Apostles extending to 62,000 lines and occupying 40 days for its performance. In England no distinction was made between miracle and mystery, miracle becoming the generic name, although few plays based on saints' lives occur. After the institution of the Corpus Christi celebration, miracles came into the hands of the town guilds, the cycle to be performed being divided into small plays and each assigned to a particular guild. Four great collections exist, the York plays (48 in number), Towneley (32), Chester (25), and Coventry (42), all dating in the 14th or early 15th c. Each follows the scriptural story from Creation to Judgment Day. There were also other cycles and many separate plays, and the performance of plays by guilds extended to nearly every town of importance in England.

In Italy in place of miracles there were *Sacre Rappresentazioni*, and in Spain and Germany the development from the liturgical to the full fledged miracle or mystery did not differ greatly from that in England or France. Only in France did the drama depart extensively from religious themes, both in the secular mysteries and also in farces of which 'Pathelin' is the best example. In spite of the sameness and artlessness of the religious drama, certain elements of development are manifest. A desire to bring the story home to illiterate audiences led to both realistic and spectacular enforcement; and the addition of episodes furnished a needed comic relief and gave opportunity for some inventiveness. Another tendency, not so clearly progressive, was didacticism which combining with the fondness for allegory led to the *Morality*, a presentation of a moral lesson through personified abstractions. Apart from its allegory, however, the morality was an advance in requiring invention of plots and in centering the interest on a moral conflict.

The Renaissance.— The mediæval drama had reached a stage that held some promise of further development, when the revival of classical learning introduced entirely foreign elements and immensely hastened dramatic progress. In the conflict and amalgamation of these humanistic and mediæval elements, modern drama had its origin. The mediæval drama, mainly religious in theme, servile in its adherence to sources, ignorant of any distinction between a narrative and a dramatic fable and blind to the absurdity on the stage of much which might be essential in a story, permitted the presentation of all kinds of action

and delighted in discordant combinations of the comic and the tragic. Against such a drama, the humanists protested and opposed their knowledge of the classics, the rules and proprieties of which they sought to impose on the theatre of their day. Their models, however, were not the Athenians, but Seneca in tragedy and Plautus and Terence in comedy; and their imitations lacked the authority of great masters as well as suitability to current theatrical conditions. The classical influence proved powerful, not through direct imitations, but rather in modifications of mediæval forms and methods, in widening the range of subjects, and most of all in encouraging innovation and experiment. The last of the 15th and the whole of the 16th centuries witnessed in the various nations of Europe this conflict between mediævalism and humanism in the drama as in other fields of literature and life. Neo-Latin plays, vernacular imitations of Seneca and Plautus miracles, moralities, interludes, and farces, every variety of form, jostled together and led at last to recognized standards and great achievement. In Spain and England, especially, national dramas arose that carried on mediæval traditions, though with much indebtedness to classical fecundation.

Italy.—Though Italy, as the home of the Renaissance, was the first of European nations to experience a revival of the drama under humanistic influence, the varied imitations and experiments of the 15th and 16th centuries failed to result in a national drama of importance. The *commedia dell' arte*, comedy of masks, continued to hold popular favor, and the *rappresentazione sacra* had an early successor in Politian's *Orfeo* (1502); but in the main the mediæval forms were discarded. Neither tragedy, though attempted by Trissino, Dolce, Giraldi Cinthio and others of international reputation in their own day, nor comedy, which attracted to its services Aretino, Machiavelli, and Ariosto, achieved, with a few exceptions, either literary or dramatic excellence. More distinctly national in character and of wider influence on other literatures than either tragedy or comedy was a new dramatic *genre*, the pastoral. It had an early beginning in Politian's *Orfeo*, and the *Aminta* of Tasso and *Il Pastor Fido* of Guarini created a dramatic form for the pastoral tradition so powerful in the Renaissance.

In the 17th c. tragedies and pastoral plays continued in abundance, but not until the 18th c. was the Italian drama again of European importance. Maffeo's *Merope* (1714) attracted European recognition, and the operas of Apostolo Zeno and Metastasio attained literary rank and vast popularity. The *commedia dell' arte*, which had spread beyond Italy and was maintaining itself in Paris, took a new departure in the dramatized fairy tales of Carlo Gozzi (1720–1808). Meantime Goldoni revived classical comedy of manners, waged war on the *commedia dell' arte* and won for himself the title of the Italian Molière. The tragedies of Alfieri (1744–1803) also won a European reputation and resulted in a contin-

uance of classical tragedy. This achievement of the 18th c. was largely under the influence of French taste, and the reaction to other models was felt in Italy as elsewhere under the impulse of the Romantic movement. The influence of Shakespeare, perceptible in the classic tragedies of Monti and Foscolo, became marked in the romantic innovations of Manzoni (fl. 1820). During the middle of the century the popular plays of Pietro Corsa illustrate the general progress in technic, and at the close of the century the work of D'Annunzio and others gave new promise for the poetic drama.

Spain.—The Renaissance resulted in a more complete survival of mediæval conditions of the drama in Spain than in any other nation of Europe. The initative attempts of the humanists made little impression on the public; and the real founder of the Spanish theatre, Lope de Rueda (fl. 1558), though not uninfluenced by classic and Italian literature, was a practical playwright who wrote for small travelling companies and adapted the current mediæval forms to please the taste of an illiterate public. Most notable of his dramatic forms was the *paso*, an interlude presenting some simple incident. He had numerous successors, including Juan de la Cueva, who declared open warfare against Seneca and chose national themes, and the great Cervantes, who wrote plays without much success. Toward the end of the 16th c. the great period of the Spanish drama begins with the career of Lope de Vega. In the course of his lifetime the theatre was firmly established at Madrid, professional activity improved, the national characteristics of the drama determined, and the plays of Lope awarded a popularity greater than that ever won by any dramatist before or since. The number of his plays almost pass belief, rising perhaps to 1,800 full-length plays without counting many shorter entertainments, and it is on record that he composed an entire play in a single day. His work is consequently marked by carelessness and repetition; it is often hardly more than improvisation, but criticism itself is breathless when it considers the variety of his invention and the cleverness of his technic. He made use of every kind of subject, religious, heroic, romantic, or realistic; and attempted with success every form of current drama, tragedy,history miracle, morality, pastoral, and most notably of all, the *comedia de capo y espada*, the cloak and sword play. The use of the point of honor as a motive in these plays of gallantry and intrigue, the importance given to women in the action, and the employment of the *gracioso*, a comic servant of the type of which Sancho Pansa is the great representative, are a few of the contributions due mainly to Lope's invention; but it is useless to analyze his contributions to a drama that he practically made anew.

The height of Lope's activity was at the beginning of the 17th c., and the great period of Spanish drama continued until the death of Calderon in 1681. In Calderon the national drama reached its acme. Less of a

creative genius than Lope and inferior to him as a playwright, he had the advantage of a generation of theatrical and dramatic progress and he possessed great genius as a lyric as well as a dramatic poet. The themes of loyalty to the king, devotion to the church, and the point of honor receive greater emphasis in his hands than they had before; in fact, a narrowness of motives and a sameness of characters detract somewhat from the dramatic power of his plays. Perhaps his genius is the most characteristically displayed in his *autos*, brief allegorical expositions of the miracle of trans-substantiation performed on Corpus Christi day, and late successors of the old religious drama.

In the 18th c. the Spanish drama, like that of the rest of Europe, came largely under the influence of French taste and models, though not until French dramatists had fond inspiration in the plays of Spanish masters. Moratin was the most successful follower of Molière; and in opposition to French supremacy, Ramón de la Cruz composed some hundreds of farces or *sainetes*, very like the old *pasos*. In the 19th c. the romantic movement made itself felt in the drama, and the *Don Alvaro* of the Duque de Rivas achieved a triumph in 1835 similar to that of *Hernani* in Paris. Later in the century José Zorrilla was perhaps the most popular of dramatists, and at the present day the plays of Echegaray have attracted international interest.

France.—Although in the middle ages, both the religious and secular drama received a higher development in France than in any other nation, yet in the 16th c. the influence of Italian humanism turned French men of letters away from national to classical models. The comic drama indeed continued, but in tragedy the Senecan exotic was for the time triumphant. Jodelle's *Cleopatre* and *Didon* were strict imitations of Seneca, retaining even the choruses; and the plays of Garnier and Montchristien highly esteemed by the literati of Europe, were similarly misdirected efforts. Toward the end of the 16th c. Alexander Hardy, a skilful playwright, made use both of the national drama and of Spanish romanticism, and gave vogue to the genre of tragi-comedy and established the rhymed Alexandrine as the verse to be employed henceforth in the drama. Hardy's plays aided in interesting people of culture in the professional theatre, and were followed by a generation of dramatic activity.

A well established theatre and a cultivated audience consequently awaited the arrival of a great dramatic poet. Corneille's (1606–89) first play of importance, the *Cid*, was based on a Spanish original and, though constructed with admirable coherence and condensation, did not adhere to the three unities. For this it was censured by the French Academy, recently instituted by Richelieu, and henceforth Corneille adopted their cramping limitations. French tragedy by his powerful example was thus committed to the form exampled by Seneca and defined by the Italian humanists, though usually the chorus was

abandoned. A certain gain in simplicity of plot and conciseness of treatment was thus obtained at the expense of a narrowing of incident and an artificiality of characterization. Corneille dealt with heroic deeds, exalted character, noble sentiments, extraordinary situations. Racine, who followed him, chose less unusual stories simplifying the action even more than Corneille, and excelled in the analysis of passion. Love is the dominant motive in his plays and the heroines are the persons for whom he seeks our sympathy. Melodious and dramatic as his verse is, it carries an impression of artificiality, at least to foreigners, perhaps largely on account of the conventionalized language demanded by the courtly and sophisticated audiences to which he appealed. French tragedy represents the elegance of court of Louis XIV., as English tragedy represents the stirring activity of Elizabethan England, and as Sophoclean tragedy represents the culmination of Athenian civilization.

The greatest French dramatist, however, was a writer of comedies. An actor, and a manager of a strolling company of players that finally established itself at Paris, Molière grew slowly to the full employment of his powers. His early experience taught him the means of winning his audience, and he availed himself of every known resource in strengthening his dramatic facility. The Italian comedy of masks, the plays of Plautus and Terence, and the methods and themes of Spanish drama were all drawn upon by him in his conquest of every department of comedy. His masterpieces, at once triumphantly effective on the stage and most penetrating in their revelation of the absurdities and weaknesses of human nature, have a fresh appeal to every reader to-day through their humor and their philosophy, and they have remained these two hundred years, the unapproached models of modern comedy.

Corneille, Racine, and Molière continued the great models of drama through the 18th c. everywhere in Europe, and naturally most of all in France. Lesage, Marivaux, and Beaumarchais were the leading followers of Molière; and the classical tragedy received new authority through the weight of Voltaire's precept and example. A new species of drama, however, arose that violated the classical restrictions on comedy and tragedy. The tearful comedy, *Comédie larmoyante*, pathetic and sentimental, had a considerable popularity in England and France, and was sustained by the criticism and plays of Diderot. Blending with another species, the *tragédie bourgeoise*, tragedy of common life, this tearful comedy has indeed continued as a recognized species under the name of *drame*. In the early 19th c. the skilful mechanism of Scribe achieved popular success without obeying the rules, but it was not until the performance of *Hernani* (1830) that the romantic liberation from the pseudo-classical restrictions was assured. The poetical brilliancy of Victor Hugo and the spontaneous inventiveness of the

elder Dumas created a romantic drama, essentially melodramatic perhaps, but at least overwhelming the pseudo-classical pretensions. During the middle of the century, when in other nations the acted drama had ceased to be a serious department of literature, it still held its own in France in the plays of the younger Dumas, Augier and others. Until the advent of Ibsen, its serious study of contemporary society offered the most hopeful sign of the reinvigoration of the drama, and its technical excellence was the model of all other theatres. More recently the varied work of many dramatists, as Hervieu and Rostand, offers evidence that French eminence in modern drama is still to be maintained.

England.—In England, as in Spain, the humanists failed to impose upon the drama the rules supposedly based on classical precedent, but in no other nation was the classical influence a more powerful germinating force. Mediæval forms variously modified continued to survive, but in *Ralph Roister Doister* (1552) and *Gorbodier* (1561), comedy and tragedy appear as highly developed forms. Though similar academic attempts, especially in Senecan tragedy, followed for some years, the establishment of the first London theatre in 1576 marked the triumph of the professional companies over their amateur and academic rivals. A dozen years later the advent of a group of clever poets determined the course of the popular drama and prepared the way for Shakespeare. The genius of Marlowe (1564–1593) brought poetry to the theatre and raised the prevailing popular forms to dramatic and literary effectiveness. He remade history and tragedy with an utter disregard for classical rules and yet, in spite of the violence and spectacle with which he delighted his audiences, he made his blank verse a noble and a dramatic expression of human passions and aspirations. Kyd borrowing from Seneca the story of revenge and the accompanying ghosts and horrors created a special type, the tragedy of blood. In comedy Lyly and Greene were the most notable innovators, the former producing artificial and courtly plays, lyrical, spectacular and abounding in witty repartee, the latter introducing romantic comedy with its averted tragedy and sentimental treatment of love. In all these plays there was rarely any attempt to follow the three unities, or to restrict in any way the presentation of the story upon the stage. The primary aim of each dramatist was to tell his story so as to please his audience, but each was also a poet, thrilled with the spirit of the years of the Armada and ardent for the glories of the new poesy.

After these innovators came Shakespeare. This is no place for even a summary of his achievement, but it may be noted that, beginning as a remaker of old plays and an imitator and adapter of the various popular types, he was throughout his career conditioned by the efforts of his fellow dramatists and the demands of the London theatres. His masterpieces are the culmination of a most varied and virile dramatic period. The most marvellous

of his gifts, his faculty of expression and his knowledge of human nature correspond to the two great excellences of Elizabethan drama, its poetry and its characterization. The blending of wit, drollery, sentiment, and fantasy that makes his comedy so enchanting and the enormous range of situation and character that displays his creative genius as supreme, were the outcomes of the freedom of the stage from restrictions and of the adventurous audacity with which the Elizabethan playwrights tried their hands at everything.

The development of Shakespeare's art was in a measure paralleled chronologically by the general development of the Elizabethan drama. During the last half of his career, perhaps in part from the survival of classical influences, the other dramatists were like him, freeing themselves from much of the lawless absurdity of earlier days. Foremost among the reformers was Ben Jonson (q.v.) who sought to impose on the popular drama as much as possible of classical regularity and propriety. He was at his best in a kind of drama that Shakespeare did not attempt, the 'comedy of humours,' plays dealing with the manners of the day; sometimes conventionalized by too close adherence to Latin models, but again, as in *Bartholemew Fair*, transcending anything else in English drama in the humor and truth of their realism. Of the other great names of the period there is hardly space here even for mention. Beaumont and Fletcher (q.v.) possessed an extraordinary cleverness of invention and facility of expression and like their contemporaries in Spain, relied on complexity of plot and ingenious alternations of suspense and surprise. The heroic romances of their collaboration and the lively comedies of Fletcher's later years, though long popular and influential on the stage, lacked the moral vigor that had been characteristic of the 16th c. drama and thus supply one of the earliest symptoms of the decline of the drama. Under James I., indeed, the drama no longer reflected a vigorous national spirit, but rather a corrupt and immoral society, and the poets no longer felt the stimulus of a free field for exploration and discovery, but wrote under the overshadowing influence of the great masterpieces of their immediate predecessors. Massenger, Ford, Middleton, Webster, Shirley and others produced plays of great beauty and power, but their best work exhibited no marked departure from the past, and in one way or another marked a moral and artistic decline.

Though the Restoration brought in French tastes and models, the influence of the great Elizabethans continued potent. The heroic plays written in rhymed verse and drawn from French romances and dramas carried on the methods of the heroic plays of Beaumont and Fletcher, and the comedies, written under the inspiration of Molière, depended largely on the examples of Fletcher and Jonson. Shakespeare's tragedy, though modified and deformed to suit the taste of the day, was dominant in the theatre.

Jeremy Collier's famous attack on the immorality of the stage made an end to a period that includes Wycherley, Otway, Congreve and Dryden and that rivalled the Elizabethan in the supremacy of the drama over other forms of literature. The divorce between literature and the theatre, thus proclaimed has never in the centuries since been completely annulled.

In the 18th c. while French examples dictated English literary drama, they never won much hold on the theatre. Frigid imitations of the pseudo-classical form such as Addison's *Cato* and Johnson's *Irene* were abundant, but even these literary imitations soon began to reflect Elizabethan models. In comedy Steele's sentimental plays correspond to the tearful comedy of France, and Lillo's domestic tragedies, based on Elizabethan predecessors and of importance abroad as well as at home in breaking the classic fetters, correspond to the tragédie bourgeoise. The vogue of the sentimental in comedy was broken by Goldsmith's *She Stoops to Conquer;* and in Sheridan's *Rivals* and *School for Scandal,* English comedy of manners reached a height not since surpassed. The Romantic Movement dealt the death blow to the vestiges of pseudo-classicism still surviving, but was peculiarly sterile in positive achievement. The romanticists essayed the drama, but neither Lamb, Wordsworth, nor Coleridge succeeded on the stage, and Byron and Shelley wrote without the stage in view. English writers in the 19th c. were too indifferent to theatrical technic to produce effective plays. Tennyson, Browning, Arnold and Swinburne have all written dramas, but they belong to the hybrid 'closet drama' that separates itself from the stage. At present in the poetical plays of Mr. Stephen Phillips and the technically skilful studies of social conditions by Mr. Pinero we may discern signs in England as on the continent of a revival of serious dramatic activity and of the reunion of literature and the theatre.

Germany.—The modern drama had no independent development in Germany until the second half of the 18th c., when Lessing took the lead in the attack on the prevailing French conventions. His own plays gave support to his preaching and Goethe and Schiller in their early plays followed him in turning to England and Shakespeare for inspiration. Their later dramas take high rank as literature, Schiller's *Wilhelm Tell* and *Marie Stuart* being perhaps the best of the romantic dramas. Most of the drama of the storm and stress period was intended for readers rather than for spectators, but the plays of Kotzebue, though with little pretentions as literature, were skilful in their adaptation to the temper of the time and to the requirements of the theatre, and carried everything before them in the theatres of Europe and America. The literary drama had a host of more worthy followers through the 19th c., the career of the Austrian Grillparzer (1791–1871) being the most notable. Recently roman-

ticism has given way to the realism of Ibsen, and perhaps the most brilliant accomplishments of the present have come from the renewed activity in the German drama, especially in the plays of Sudermann and Hauptmann.

Scandinavia.—The Scandinavian drama first becomes of European importance in the work of Ibsen. Beginning with historical dramas following the prevailing romantic fashion, he advanced to the amazingly fantastic and original *Peer Gynt*, and then, in self-imposed exile from Norway, produced the series of social dramas that are influencing so pervasively the theatre of the modern world. Both by their profound criticism of modern life and by their technical reforms, they seem likely to mark the beginning of a new era in the history of the drama. Written in concise, unadorned prose, free from the soliloquies and lyrics and embellishments that romanticism confirmed, they return to the simplicity and directness of the Greeks; and at the same time are as modern in technic as in the problems and the psychology that they present.

America.—America has long had a theatre of importance but not a drama. The first theatre in 1766 was followed after the Revolution by the first important acted play by an American, the *Contract* by Royall Tyler, afterwards chief-justice of Vermont. William Dunlap, the first dramatist of influence, translated from the popular Kotzebue and produced many plays of his own. The visit of Kean in 1820 marked the establishment of the theatre as a social institution of importance and has been followed by frequent visits from most of the great European actors; and, since Forrest played Othello in 1826, there has been a famous succession of distinguished American actors. The drama, however, has in the main continued servile imitation of European models. After Kotzebue, Scribe and Sardou were translated or imitated here as elsewhere, and the reproduction of foreign plays to the discouragement of American authors was fostered until 1891 by the absence of any international copyright. The development of the drama in Europe during the 19th c. has, however, been paralleled in some degree in the United States. There has been the same advance in technic; the same conflict between romanticism and realism, and the same powerful influence of the novel upon the drama. This last influence has been perhaps stifling rather than stimulating and has led recently to a great popularity of dramatized novels, of which *Uncle Tom's Cabin* at least has had an international vogue. More promising for the future of a national drama has been the tendency to present various phases of American life illustrated by the success of the *Old Homestead* and by the more worthy plays of Mr. Bronson Howard and Mr. Augustus Thomas.

The promise for the future may also be said to be shared by Americans along with the European nations. The drama has never been so cosmopolitan as to-day. The

conditions of stage presentation in every nation are practically the same; the progress in technic has been shared by all; the stimulation that comes from the originality of Ibsen, Maeterlinck, Hauptmann, Hervieu, Rostand, or Pinero is immediately a common possession. In the careful workmanship of not a few recent plays and in the serious study of contemporary social conditions, there are not lacking signs that America will take an active part in whatever dramatic advance may distinguish the 20th c.

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DRAMMEN, *drâm'mĕn:* seaport town of Norway, province of Aggerhuus, on both sides of the river Drammen, which here discharges its waters through the Drammen fiord into the Gulf of Christiania, about 24 m. s.w. of Christiania. Drammen, which is built in a valley, is divided into three quarters—Bragenœs on the n. bank of the river, and Stromsoe and Tangen on the s., united to the first by a handsome bridge. The chief streets, which run along each side of the river, are mainly of houses. The manufactures of Drammen are leather, ropes, sailcloth, tobacco, spirits, and earthenware; but the chief industry is the export of timber. Pop. (1900) 23,093.

DRANESVILLE, Battle of: Dranesville is on the Alexandria and Leesburg turnpike, 16 m. n.e. of Washington; and 1861, Dec. 20, to collect a supply of forage near there, Gen. E. O. C. Ord, with his brigade of Pennsylvania Reserves, the First Pennsylvania Rifles, a battery of four guns and a detachment of cavalry—in all about 3,900 men—moved from camp near Langley's. Driving a few Confederate cavalry from Dranesville, he entered it. It happened that the same morning Gen. J. E. B. Stuart started from the Confederate lines at Centreville with a brigade of infantry, 150 cavalry, 4 guns, and about 300

wagons, to gather hay near Dranesville; and he was so engaged when he heard that Ord was approaching. Fearing for the safety of his train, and believing that the only way to save it was to attack Ord, he advanced for that purpose, at the same time ordering his wagons back to Centreville. Stuart attacked with great impetuosity, and after a severe fight of two hours was defeated and retreated to Centreville, with a loss of 186 killed and wounded. Ord's loss was 67 killed and wounded.

DRANK, v: See DRINK.

DRAPE, v. *drāp* [F. *drap*, cloth; *draper*, to make cloth, to cover—from mid. L. *drappum:* Sp. *trapo*, tatters, cloth]: to cover with folds of cloth or drapery for use or ornament. DRA'PING, imp. DRAPED, pp. *drāpt:* ADJ. having on drapery; clothed. DRAPER, n. *drā'pėr*, one who sells cloths in England, dealers in woolen cloths for garments DRAPER'S COMPANY, in London, one of the wealthy civic corporations, with a hall and almshouses. DRA'PERY, n. *pėr-ĭ* [F. *draperie*]: hangings; curtains, cloth goods, *Drapery, in Art*, is the representation of folds of cloth, clothing, or dresses in paintings or sculptures. From the very great difficulties with which the artist has to struggle in dealing with the arbitrary and ungraceful forms of modern dress (see COSTUME), we are often led to regard drapery as an impediment, in place of an aid and accessory, to the representation of the human form in plastic art. The error of this conception is manifest at once to those who direct their attention to the study of drapery in antique art, with a view to discovering not so much how as why it was employed by a people whose national customs admitted of their almost wholly dispensing with it had they felt so disposed. Such a study brings into view the fact that, when properly disposed, drapery tends, in many cases, to exhibit the form, to enhance the characteristics, and to intensify the attitude, whether in action or in repose. Drapery tells, moreover, something of the circumstances in which the action takes place beyond what could possibly be told by the naked figure. The waving or streaming drapery of a hunting Diana, or an Apollo shooting with the bow, tells us at once that the action is taking place in the open air, with the fresh breezes of the Ægean blowing around them. On the other hand, that repose which is the peculiar characteristic of sovereignty, is indicated by the still and heavy character of the drapery which surrounds a Jupiter on Olympus, or a Cæsar on his throne. The simple rule for the disposal of drapery, seems to be that it shall never be employed without an object; and that every fold shall be a result, either of the form of the figure, of the circumstances in which it is placed, or of some previous fold to which the latter is subordinated.

DRAPER, ANDREW SLOAN, American lawyer and educator: b. Westford, N. Y., 1848, June 21. He attended the public schools of Albany until 1863, when he won a prize scholarship in the Albany Academy. Upon graduating in 1866 he became instructor there, and principal of

a graded school, through the next four years. After graduating from the Albany Law School and the School of Law of Union University, he was admitted to the bar in 1871, and practised in Albany till 1887. In 1881 he was elected to the legislature, and for several years was actively engaged in politics. In 1884 he was appointed by President Arthur one of the judges of the United States Court of Alabama Claims, serving until the duties of that court were concluded.

It is, however, for his long and distinct service to the administration of American education that Dr. Draper is best known and appreciated. From 1878–81 and again from 1890–2 he was a member of the board of education in Albany; when in the legislature in 1881 he was a member of the committee on public education; in 1882 he became one of the board of the State Normal School in Albany; in 1886 and again in 1889 was elected, by the legislature, State superintendent of public instruction. From 1889–91 he was president of the National Association of School Superintendents; 1892–4 superintendent of public schools of Cleveland, Ohio; in the latter year resigned this position to become president of the University of Illinois, acting in that capacity for 10 years; in 1902 was appointed by President Roosevelt a member of the United States Board of Indian Commissioners; in 1903 was elected president of the North Central Association of Colleges and Secondary Schools; and in 1904, March 9, was chosen commissioner of education of the State of New York. He was chairman of the Department of Education of the International Congress at Saint Louis, 1904, and was awarded the grand prize of the exposition for the preparation of educational exhibits from Illinois and New York. Dr. Draper has written largely on historical and educational matters, and in 1905, beside contributing many articles himself to the work, became editor of the educational department of the *Encyclopedia Americana.* Among his numerous publications are: *How to Improve the Country Schools* (1887) *Powers and Obligations of Teachers* (1887); *School Administration in Large Cities* (1888); *The Indian Problem in the State of New York* (1888); *History of the New York Common School System; Legal Status of the Public Schools* (1890); *The Authority of the State in Education* (1890); *A Teaching Profession* (1890); *American Schools and American Citizenship* (1891); *The Spirit of the Teacher; Science in the Elementary Schools; The Pilgrims and Their Share in the National Life; American Universities and the National Life; The Illinois Life and the Presidency of Lincoln; The Rescue of Cuba; Bankers and the Community Life; John Marshall and the March of the Constitution; Memorial of President McKinley; Coeducation in America; The Personal Equation in the Medical Profession; The Recovery of the Law; The University's Return to the State; The Element of Inspiration in the Schools; Educational Tendencies, Desirable and Otherwise; University Questions Concerning the Common Schools; Organization and Administration of American Educational System;* etc.

DRAPER, Daniel, American meteorologist: b. New York, 1841, April 2. He studied science under his father J. W. Draper (q.v.), acting as his assistant and amanuensis for years. After 1869, he was director of the New York Meteorological Observatory, the self-recording instruments in use there being of his design. He has written a *Treatise on the Causes of Pneumonia* and also helped his father in the preparation of his *History of the Intellectual Development of Europe.*

DRAPER, Henry, American scientist: b. Prince Edward co., Va., 1837, March 7; d. New York, 1882, Nov. 20. He is a son of J. W. Draper (q.v.). He was well known for his work in the line of celestial photography, and published *A Text-book on Chemistry* (1866).

DRAPER, John Christopher, American physician: b. Prince Edward co., Va., 1835, March 31, d. New York. He was graduated from the medical department of New York University; was professor of physiology in that institution 1858–60, and professor of chemistry in the medical department 1866–85. He was also professor of chemistry at Cooper Union, and professor of physiology and natural history at the College of the City of New York. He edited the *Year Book of Nature and Science* (1872–3) and for three years edited the natural science articles in *Scribner's Monthly.* He wrote: *Production of Urea* (1856); *On Respiration* (1856) *Text-Book on Anatomy, Physiology, and Hygiene* (1866); *Practical Laboratory Course in Medical Chemistry* (1882); *Text-book of Medical Physics* (1885).

DRAPER, John William, American physiologist and chemist: b. Saint Helens, Lancashire, England, 1811, May 5; d. Hastings-on-the-Hudson, N. Y., 1882, Jan. 4. He obtained his early schooling at Woodhouse Grove, in a Wesleyan Methodist institution, and then took up courses in chemistry, physics, and higher mathematics under a private tutor. In 1833, when 22 years of age, he came to the United States and entered the University of Pennsylvania, there taking a course in medical studies, and graduating with his degree of M.D. in 1836. Shortly after graduating he received an appointment to the chair of chemistry, natural philosophy, and physiology in Hampden-Sidney College in Virginia, continuing in that capacity until 1839. It was then that he commenced the experimental researches which rendered his name famous, and during those years he contributed the results of his experiments to the *American Journal of Medical Sciences.* In 1839 he was called to the chair of chemistry and natural history in the academic department of the University of New York, and also gave lectures on physiology to the more advanced undergraduates. In 1841 he became professor of chemistry in the University Medical College, and in 1850 professor of physiology. Draper made many improvements in the art of photography; following out the principles as invented by Daguerre in 1839, he commenced experimenting along the same lines and became the pioneer of photography in America, and it was he who first applied

photography to the portrayal of the human face, his first photograph being that of his daughter, taken in 1839. He also discovered and described 'misers' images or roric figures, and about the same time applied the use of ruled glasses and specula to the study of chemical action of light.

Dr. Draper's writings were numerous, among the most important of them being: *A Treatise on the Forces Which Produce the Organizations of Plants* (1844), in which the author demonstrates that the most intense action of sunlight is produced by yellow rays; *Text-book on Chemistry* (1846); *Text-book on Natural Philosophy* (1847); *Human Physiology, Statistical and Dynamical, of the Conditions and Course of the Life of Man* (1856); *History of the Intellectual Development of Europe* (1862), a work of great importance and very widely read, later being translated into 10 languages, the purpose of the book being to show that social advancement is as entirely dominated by natural law as is bodily growth; *History of the American Civil War* (1867–70); *History of the Conflict Between Religion and Science* (1875); etc. His collected works were published in 1878, entitled *Scientific Memoirs Being Experimental Contributions to a Knowledge of Radiant Energy.*

DRAPER, Lyman Copeland, American antiquarian: b. Hamburg, N. Y., 1815, Sept. 4; d. Madison, Wis., 1891, Aug. 26. He removed to Wisconsin in 1853; became corresponding secretary of the State Historical Society, and it was mainly through his efforts that the State secured its library and its important antiquarian collection. He published *Collections* of the State Historical Society (10 vols. 1853–87); *Madison the Capital of Wisconsin and its Heroes* (1857); *King's Mountain and its Heroes* (1881).

DRAPER, William Franklin, American manufacturer: b. Lowell, Mass., 1842, April 9. He was educated in the public schools and at a private academy, served in the Federal army through the Civil War, becoming brigadier-general by brevet. He became a successful manufacturer of cotton machinery and made and patented many improvements in it. He was a presidential elector in 1888; a Republican member of Congress 1892–7; and United States ambassador to Italy 1897–9. While in Congress he was a member of the Committee on Patents and the Committee on Foreign Affairs.

DRAPER, William Henry, Canadian jurist and legislator: b. near London, England, 1801, March 11; d. Yorkville, Toronto, 1877, Nov. 3. After obtaining his early education in England, in 1820 he went to Canada, where, after being admitted to the bar in 1828, June 16, he rapidly won promotion and distinction. His advance to high rank among Canadian jurists was accomplished mostly through the prominent part he played in the early governmental policies of Upper Canada. He was reporter to King's Bench, 1829–37; solicitor-general of Upper Canada, and a member of the executive council, 1837–41; the first attorney-general appointed in Upper Canada, 1841–7; a puisne judge of Queen's Bench, 1847–56; chief

justice of the Court of Common Pleas, 1856–63; chief justice of Upper Canada, 1863–8; and president of the Court of Error and Appeal, Ontario, from 1868 till his death. He wrote: *Upper Canada King's Bench Reports*, 1729–1831 (2 vols. 1877). He will perhaps be best remembered for introducing in the legislature of Upper Canada legislation by the terms of which the Clergy Reserves were to be sold and the proceeds divided—the greater part going to the Church of England and the balance to the other Christian churches. This was carried by a small majority and afterward made law by imperial legislation. Consult: Hopkins, *The Nineteenth Century: Progress of Canada* (Vol. IX., Toronto, 1900).

DRAPERY. See COSTUME.

DRAPIER LETTERS, a series of letters published by Dean Swift, over the signature M. B. DRAPIER in 1724. They were called out by the proposal to impose upon Ireland a debased coinage, from which a court favorite and a king's ministers were to get the profit. The opposition to the action excited by these letters defeated the project and gave Swift a reputation he never lost. See SWIFT, JONATHAN.

DRASTIC, a. *drăs'tĭk* [Gr. *drastĭkos*, active, vigorous—from *drăō*, I do, or act: F. *drastique*]: powerful; acting rapidly and violently: N. a strong purgative medicine. DRAS'TICS, n. plu. *-tĭks*, powerful purgatives.

DRAUGHT, n. *drăft* [from *drag* or *draw*, which see: Dut. *dragt*, a load, a burden: Icel. *draga*, to draw]: that which is dragged or drawn; the act of drawing, or quality of being drawn; force necessary to draw (as applied to plows, wagons, etc., see TRACTION): act of drinking, of the quantity drunk at once; the number of fish caught at one drag of the net; a detachment or number drawn away, as men from an army; the depth to which a ship sinks in water when afloat; a current of air; a delineation or representation of a thing by lines; in *Scrip.*, a sink; a privy—see Matt. xv. 17: V. to draw out; to detach from the main body. DRAUGHTY, a *drăf'tĭ*, exposed to fitful currents of air. DRAUGHT-BOX, or DRAFT-BOX, n. an air-tight tube invented by Parker, by which the water from an elevated wheel is conducted to the tail-race. It is a means of rendering the whole fall available without placing the wheel at the bottom. DRAUGHT-COMPASSES, n. compasses with movable points, used for drawing the finer lines in mechanical drawings, plans, etc. DRAUGHT-EQUALIZER, or DRAFT-, n. a treble tree; a mode of arranging the whiffletrees when three horses are pulling abreast, so that they may all exert equal force. DRAUGHT-FURNACE, or DRAFT-, n. a reverberatory air-furnace; one in which a blast is employed. DRAUGHT-HORSE, a horse that draws loads, opposed to a *saddle-horse*. DRAUGHT-HOOKS, hooks on each side of a cannon carriage. DRAUGHTSMAN, n. *drăfts'măn*, one who draws plans or designs, differing from a designer as he does not originate, but only reproduces,

develops, or fills out the plan supplied him: see DRAFT. DRAUGHT-ROD or DRAFT-, n. a rod extending beneath the beam of a plow, from the clevice to the sheth and taking the strain off the beam. DRAUGHT-SPRING, or DRAFT-, n. a spring intervening between the tug or trace of a draught animal and the load, whereby a jerking strain upon the animal is avoided.

DRAUGHT (or DRAFT) OF WATER, in Maritime Affairs: depth to which a ship sinks in the water when fairly afloat. The draught is marked on the stem or stern-post, or on both, from the keel upward. When a ship is in good trim, the draught does not differ much at the two ends. Ships with sharp bottoms draw more water, or have a 'greater draught,' than those of flatter construction.

DRAUGHTS, or CHECKERS: game played with 'men' on a checkered board, like a chess-board. As far as the *science* of the game is concerned, it falls far short of chess, but nevertheless requires considerable thought and skill. In France, it is called *Les Dames*, from having been favorite with ladies; and in Scotland, the draught-board is called the *Dambrod*. In the U. S. the name *Checkers* is most usual.

Two persons usually play this game, each having a set of 12 men—one set black, the other white. The men may be placed either on the black or white squares, but the whole must be placed on one color only. Thus, in England, it is usual to play upon the white squares, with a black square at the lower right; and in Scotland upon the black, with a white square at the lower right. In the U. S. also, the men are usually on the black squares. In chess the men have different powers and moves; but in draughts all are equal, except that some may, in play, become advanced to 'kings.' In chess, men may be moved straight forward, sidewise, or diagonally, and over many squares at once; but in draughts, the men may be moved diagonally only, and by *one* square at a time, unless when capturing an adverse man which is done by a jump over the captive. If an enemy's man stand in the way, no move can take place unless there be a vacant square beyond into which the piece can be lifted. The man leaped over is then taken and removed from the board. The grand object of the game is, therefore, to clear the board of the enemy's men, or to hem them in so that they cannot be moved, and whichever party does so first, wins the game. As no man can move more than one step diagonally at a time, there can be no taking till the antagonists come to close quarters; and the advancing of them cautiously into each other's neighborhood is the chief art of the game. When a man on either side has made his way either by taking or by a clear open path, to the opposite side of the board, he is entitled to be 'crowned,' which is done by placing another man on the top of him. Crowned men or kings may move either forward or backward, but always diagonally and by one square at a time, as before; and this additional power thus gained gives a

great advantage to the player who gets the greatest number of kings, and usually decides the game in his favor.

DRAVE, *drä'vë*, or DRAU, a European river which rises in Tyrol, flows east-southeast, part of its course between Hungary on the left and Croatia and Slavonia on the right, and after a course of 400 miles joins the Danube 14 miles e. of Essek. It is navigable for 200 miles.

DRAVID'IAN, a term applied to the people who inhabited the southern part of what is now India previous to the advent of the Aryans, and also to the language spoken by these same people. The Dravidian languages are generally considered to belong to the Turanian class—a family of languages said by some authorities to include all the Asiatic languages in general, outside the European and Semitic families. The Dravidian languages include the Tamil, Telugu, Canarese, Malayâlam, Tulu, Tuda, Gond, Rajmahal, and Oraon. There are other minor subdivisions made by some authorities. Only the first four mentioned have a literature. The Dravidians now occupy the greater part of the peninsula of India. The Tudas, or Todas, in the region of the Nilgiri Hills, belong to the lowest of civilized people or races, while among the Tamils are found many who have attained a high place in literature.

The Dravidians proper are quite distinct from the Aryans, but they have been assimilating with those around them, so that now among them may be found traces of the Caucasians, and their literature partakes much of the Arian culture; but they have kept their speech comparatively pure for centuries. In the southeastern part of the peninsula and in Ceylon live those who speak the Tamil; estimated to be about 16,500,000 people. North of the Tamils, and on the east, are the Telugus, about the same in number. The Canarese is spoken by about 10,000,000 people who live in the western part of the peninsula; and the Malayâlam by about 4,230,000 people who live in the southwestern part of the peninsula.

In the Tamil and Telugu languages there are a number of excellent literary productions; not all original, some are modeled on or adapted from the Sanskrit. Two of the poems which may be traced to at least the 10th century—but which the Tamils claim are much older—are the *Kintanamani* and the *Naladiyar*. The latter has been translated by Pope. The Tamils claim also that Agastya lived before Christ, and that he was the first teacher of science and literature. In about the 12th c., the poet Kambar made, in Tamil, an adaptation of the Sanskrit poem *Ramayana*, one of the two great epics of India; and in the 16th c. the poet Ati-Vira-Rama Pandya, a native king, wrote works of merit. The Tamil poet Tayumanavar wrote in the beginning of the 18th c.; and at about the same time, an Italian missionary, a Jesuit named Beschi, wrote in the Tamil, both prose and poetry. The work of this literary priest has done much toward directing the attention of eastern scholars to the Tamil language and literature.

The oldest poem extant in Telugu language is a version of the Sanskrit poem, the *Mahabharata*, the other of the two great epic poems of India. This poem was written in the Telugu by Nannaya Bhatta, in the 12th c. A poet named Cesava of the 12th c. wrote in the Canarese. In the Malayâlam there is one poem based upon the Sanskrit, an account of Rama, a heroic prince who belonged to a royal house of India. There are also versions of both the *Mahabharata* and the *Ramayana*. Consult: Dalton *Descriptive Ethnology of Bengal;* Kingcote *Folk-Lore of Southern India;* Caldwell, *Comparative Grammar of Dravidian;* Oppert, *Original Inhabitants of India;* Hunter, *Dictionary of the Non-Arian Languages;* Pope, *First Lessons in Tamil;* Graul, *Tiruvalluver's Kural;* Hultzsch, *South Indian Inscriptions, Tamil and Sanskrit;* Arden, *Grammar of the Telugu Language;* Brown *Dictionary of Telugu;* Hopkins, *Great Epic of India;* Fraser, *Literary History of India;* Carr, *Collection of Telugu Proverbs.*

DRAW, v. *draw* [AS. *dragan;* Icel. *draga*, to drag or draw: Dut. *trecken*, to draw, as a sword, to trace outlines: L. *trahĕrĕ*, to draw]: to cause to move toward by pulling; to haul; to raise, as water from a well; to pull along; to pull out or unsheathe; to attract; to suck or inhale; to take or let out a liquid; to sketch or delineate; to describe; to allure or entice; to write in due form, as a bill of exchange; to have, receive, or take, as money; to protract or lengthen; to pull or exert strength in drawing; to move; advance, or approach; to require a certain depth of water, as a ship; to take the entrails out of, as a fowl. DRAW'ING, imp. DREW, pt. *drô*. DRAWN, pp. *drawn:* ADJ. one in which neither side wins, said of a battle or game. DRAWABLE, a. *draw'ă-bl*, that may be drawn. DRAWBACK, n. any loss of advantage in enjoyment, etc.: a certain amount of duties or customs on goods paid back. DRAWBRIDGE, n. a movable bridge over water (see BRIDGE). DRAW-CUT, n. an oblique motion of a knife. moving lengthwise across an object as well as cutting into it. DRAW-FILING, n. drawing a file longitudinally up and down a piece of metal, without giving the tool any movement in the direction of its length. DRAW-KILN, n. a lime-kiln arranged to afford a continuous supply of lime from below, fuel and limestone being fed in above from time to time; also called a Running-kiln, or Continuous kiln. DRAW-LOOM, n. in *weaving*, the predecessor of the jacquard; it is used in figure weaving. DRAW-NET, n. a net with large meshes, used for catching the larger varieties of fowls. DRAW-PLATE, steel-plate with a graduated series of holes, through which metals are drawn in making wires or bars; also a plate of metal placed before a fire on a hearth, or before the lateral opening between the top of the fireplace and the throat of the chimney. Its use is to force the draft of air to pass through the fire on its way into the chimney, instead of allowing it to pass over the fire. DRAW-POINT, n. in *engr.*, the etching-needle used on the bare point; also called Dry-point. DRAW-TUBE, n. the adjustable tube

of a compound microscope, having the eye-piece at its outer end, and the erecting-glass (if any) at its inner end. DRAW'ER, n. *-ėr*, one who draws a bill of exchange (see DRAFT; BILL). DRAW'EE, n. *-ē*, the person drawn on by a bill of exchange. DRAWER, n. *draw'r*, a sliding box in a table. DRAWER-LOCK, n. a form of inside or mortise lock which projects its bolt into the strip above. DRAWERS, n. plu. *draw'rs*, light underclothing in the form of breeches or trousers. CHEST OF DRAWERS, a case of sliding boxes for containing clothes or household articles. DRAW'ING, n. the representation of a thing on a flat surface. DRAWING, the act of distributing prizes in a lottery by lots drawn; the selection of certain numbers by drawing them out of a box or wheel; in *metal*, the operation of hammering, rolling, or drawing through a die, by which a bar or rod of metal or a wire is extended in length to form a rod, tube, or plate; in *casting*, said of a pattern whose shape is such that it may be withdrawn from the sand without breaking the molded form; in *spinning*, the gaining of the mule-carriage; its progress after the feed is stopped draws out the yarn; in *fibre*, extending a sliver for the purpose of drawing its fibres parallel and increasing its length. DRAWING-ACCOUNT, n. in *com.*, sum of money left in a banker's hands, upon which checks can be drawn at any time without notice. DRAW'ING-AWL, n. in *leather*, a leather-worker's awl, having a hole near the point in which the thread is inserted and pushed through in sewing. DRAWING-BOARD, board on which drawing-paper is strained for painting in water-colors, or for a sketch or design. For painting, the paper is wetted. The wet paper is attached to the edges of the board with paste or thin glue, and when dry it becomes firm and flat. When the work is finished, the paper is cut beyond the drawing with a knife. DRAW'ING-COMPASS, n. an instrument with two legs, used for striking circles and curves. One leg has a pen or pencil, and it has several modifications, such as Bow-pen, Bow-pencil, and Beam-compass. Compasses for measuring and transferring measurements are called Dividers, Bisecting-compass, Proportional-compass, etc. DRAWING-KNIFE, n. blade having a handle at each end, used by coopers, wagon-makers, and carpenters; a tool used for cutting a groove as a starting for a saw-kerf. DRAWING-MASTER, one who teaches the art of drawing. DRAWING-PAPER, n. a variety of large white paper, made preferably of linen stock, and of 14 sizes. DRAWING-PEN, n. a pen for ruling lines, consisting, in its most usual form, of a pair of steel blades, between which the ink is contained, the thickness of the line being determined by the adjustment as to distance of the said blades. DRAWING-PIN, n. a flat-headed tack for temporarily securing drawing-paper to a board; a thumb-tack. DRAWING-POINT, n. a steel tool for drawing straight lines on metallic plates; a scriber for metal; the draw-point or dry-point of an engraver makes its mark directly upon the metal and not at the etching-point, which makes a mark through a ground, the line

being subsequently eaten into the metal by acid. DRAWING-ROOM [an abbreviation of *withdrawing-room*]: the room in a house set aside for the reception of company, so called because it is the room to which the company withdraws after dinner; the formal reception of company at the court of a sovereign. DRAW-WELL, a deep well from which water is drawn by means of a rope. HANGED, DRAWN, AND QUARTERED, hanged, after which the heart is taken out, the body is dismembered, and the quarters distributed—in *England* the punishment for treason, and still the law, though fallen into desuetude (the sovereign may, and now certainly would, by warrant change the sentence into beheading. Stephen's *Commentaries*, iv. 234: see TREASON). DRAWN-BRUSH, n. any brush in which the tuft or knot is drawn into the hole in the stock by a loop of copper wire. DRAWN-BUTTER, n. in *cook.*, butter melted and prepared for use as gravy; melted butter.

DRAW'BACK, in Commerce: duties or customs, remitted or paid back in part or whole by government, on certain classes of articles when they are exported. Excise duties enhance the price of the commodity on which they are imposed. Were these duties not remitted or drawn back, the commodity so taxed would not be ordered by those foreign countries where articles of the same kind could be purchased free of such duties: thus exportation would be checked. To afford facility for the exportation of such articles, the state resorts to the expedient of returning to the exporter a sum equal in amount to what he or the manufacturer had paid to the excise. Such is drawback.

DRAWBRIDGE, a bridge with a lifting or sliding floor, such as may be used for crossing the ditches of fortresses or may be constructed to cross navigable waters where the height of the roadway is insufficient to allow vessels to pass underneath. There are various kinds of draw bridges. One is the lifting bridge, which is raised bodily on one end. For fortifications this is the kind commonly employed, the platform forming or strengthening the gate when raised.

DRAW'ING, in Art: delineating form, as distinguished from color and light and shade. The term is not confined to the first outline produced by the pencil or crayon, though this is a narrower sense in which it is also used, and what is usually meant by a drawing. In its wider sense, drawing is used to describe what is in reality the most important feature of a finished painting of Raphael or Correggio, as well as an outline by Flaxman or Retch. Drawing, in this sense, has been termed the grammar of art. But the analogy is incomplete; for the one quality requisite in the application of grammar, is correctness, whereas drawing, even when correct, even when faultless, admits of degrees of perfection. It may be more or less powerful, more or less free, more or less graceful; and, indeed, there is no characteristic in which the great artists of the Italian and Flemish

schools more unmistakably excel all their successors, than in the power and beauty of their drawing. Neither is there any feature which more unmistakably stamps the individuality of the artist upon the picture.

The various styles of drawing may be divided into three kinds: (1) pen drawings; (2) chalk drawings, which may include lead-pencil drawing; (3) drawings shaded with the brush or hair-pencil. Pen drawings are often confined to pure outlines; an appearance of relief or projection being given by thickening the lines on the shadow side. Finished pen drawings have all the shading produced by a combination of lines termed hatching. Small, fine-pointed brushes are now often used instead of the pen, more delicacy and variety of tone being obtained. Drawings shaded with the brush are outlined with the pen, the shading being laid on or washed in with the brush in tints of Indian ink, sepia, or bistre. This method is used chiefly for architectural drawings and historical sketches. Chalk drawings are most suited for beginners, as the errors can be easily corrected. Black, red, and white chalks are used. When the chalk is powdered and rubbed in with a stump, large masses and broad effects can be produced with much rapidity.

Drawings may be divided into five classes: sketches, finished drawings, studies, academic drawings, and cartoons. First sketches are the ideas put upon paper by an artist, with the intention of carrying them out with more completeness and detail in some more elaborate work. They are merely intended to fix and retain his first thoughts. Finished drawings are such as are carefully executed and made complete in all their parts. By studies are generally understood separate parts of objects carefully drawn either from life or from figures in relief; for example, heads, hands, feet, arms; but sometimes the term is applied to drawings of entire figures. To this class also belong drawings of the skeleton and muscles, as well as of draperies, animals, trees, foregrounds or other parts of landscape. Academic drawings are those made in art academies from a living model in lamplight, which brings out the shadows more than daylight. The position of the person who serves as a model is carefully arranged at the commencement of each sitting, and in that position he is required to maintain himself. In this way the learners practise themselves in the drawing of the figure in various attitudes. In studying drapery and dress, a lay figure, made of wood and with movable joints, is clothed in various styles, and drawings made from it. Cartoons are drawings made on stout paper of the size of the paintings to be executed from them. They are mostly employed for pictures of large size, and are regularly used by fresco painters. The design is pricked through or traced from the cartoon upon the surface that is to receive the finished picture. See CARTOON.

The best mode of acquiring the art of drawing is to commence by the simplest geometrical lines, proceeding

to geometrical figures, from the more simple to the more complex. The student should first practise drawing accurately—perpendicular, horizontal, oblique, curved, and waved lines; then he should draw squares, triangles, circles, and ovals. These forms are the best for early instruction, because from their simplicity any inaccuracy in their delineation is easily detected. When the learner has conquered the difficulty of drawing these forms with accuracy he should proceed to draw those of a more arbitrary kind, such as the scroll and cylinder; then pyramids, obelisks, or vases, cups, books, baskets, etc., by which he will gradually become possessed of a more correct vision, and be able to give a proper degree of grace to his curved lines.

Having acquired a sufficiently facility in drawing and shading these simple forms, he ought next to proceed to drawing from copies outlines of antique busts and statues. Such subjects are well calculated to give correctness to the eye, as from their beauty and perfection any slight deviation from their just proportions instantly offends and is easily detected. On the other hand, when landscapes and flowers are used as copies, an error in drawing the irregular forms that occur in them is much less easily perceived, the student is apt to be too easily satisfied with his work, and to fall into negligent habits which cannot afterward be easily eradicated. All these drawings should be made on a large scale, and be executed in a bold, distinct, and what painters call a broad style. Thus all the separate features of the face should be drawn the full size of life; for next to drawing from bad examples, nothing is a greater hindrance to proficiency than the making of small and miniature drawings.

In beginning a drawing, first get the object or objects into proper position on the paper, next into proper size, and last into proper shape. By inverting this mode of procedure learners frequently render their work very irksome, and are mortified to find that when they have matured a portion of their drawing, the part is not truly in position, or not of the proper size. The learner's first care should be accuracy of outline; next a studious observation of the shading and shadows that give roundness and relief to objects, combined with an earnest aiming at perfect manipulation. These being mastered, boldness of touch and rapidity of execution will follow.

Chalk-drawings are generally executed on a colored paper, for the purpose of producing a middle tint, so that a drawing on gray or stone-colored paper will have three degrees or tones of color—two from the chalks and one from the paper. Charcoal is used to sketch in the outline, which is then matured and made correct with Italian or hard black chalk. The shadows are laid in freely and broadly with soft black French chalk, and then softened and blended together with a stump. Chalk has many advantages over black-lead pencil; more especially it is suited for drawings of large size, and it is by practising

on a large scale that freedom and accuracy of hand are mainly to be acquired.

Before attempting to make sketches of landscapes from nature, the student ought to be pretty well acquainted with the general rules of perspective. He may then sketch whatever pleases him, commencing with the foreground and nearest objects, and from them comparing the size and relative positions of the more distant; for instance, if a wall or building come into the foreground of the sketch, from it he may find the position of a more distant object, such as a church, by comparing horizontally what part of the wall the church is opposite, and so on, for the retiring distance.

Literature.—Cross, *Color Study;* Hamerton, *Drawing and Engraving;* Hutchinson, *Some Hints on Learning to draw* (1893); Leland, *Drawing and Designing;* Maginnis, *Pen Drawing* (1900); Ruskin, *Elements of Drawing;* Spiers, *Architectural Drawing;* Veollet, *Learning to Draw;* Walker, *Handbook of Drawing;* White, *Drawing for Reproduction;* Wilson, *Free-hand Perspective.*

DRAWING AND QUARTERING, the punishment of treason in Great Britain in force till 1870. The law provided that the offender be drawn to the place of execution on a hurdle; that he be hanged by the neck and disemboweled; that his head be severed from his body, and that body be divided into four parts, or quartered.

DRAWING-BOARD, a board on which paper is strained for water-color painting. It is made of a flat piece of wood held together and prevented from warping by an edging of other pieces, the grain of which runs in an opposite direction. The drawing-paper is first damped and then attached to the edges of the board with thin glue, gum, or paste, and when dry becomes perfectly tight and flat.

DRAWL, v, *drawl* [Dut. *draelen;* Fris. *draulen;* Icel. *drolla,* to delay, to loiter: prov. Dan. *drövle,* to be slow at one's work]: to utter words in a disagreeably slow tone: N. a long monotonous tone in speaking. Draw'ling, imp. Drawled, pp. *drawld.* Draw'lingly, ad. *-lĭ.*

DRAWN: pp. of Draw, which see. Drawn-battle, a contest or fight in which neither side is a victor.

DRAY, n. *drā* [Sw. *drog,* a sledge, what is dragged along: L. *traho,* I draw]: a strong low cart on wheels; a sled or sledge. Dray-cart, a brewer's cart. Dray-horse, a heavy and strong horse. Drayman, the man who attends on a dray.

DRAY, or Drey, n. *drā:* the nest of a squirrel.

DRAYTON, *drā'ton,* Michael: 1563–1631; b. Hartshill, Warwickshire, England. Of the events of his life little is known. He is supposed to have studied at the univ. of Cambridge, and to have been in the army when young. His earliest work, *The Shepherd's Garland,* was published 1593. He afterward published the *Barons' Wars, England's Heroical Epistles,* etc. The *Polyolbion,* the work by

which he is best known, appeared 1613. He was poet laureate in 1626. He was buried in Westminster Abbey. As a poet, Drayton is little known, save to readers such as Charles Lamb, who delighted in the obscure corners of literature. His *Polyolbion* is a topographical poem; and passages from it, now and then met with in county histories and works of an antiquarian character, surprise the reader with their stately rhythm, their nervous force, and their felicity of diction. Vols. I. II. and III. of a complete edition of Drayton's works, by the Rev. Richard Hooper, M.A., were published 1876.

DRAYTON, WILLIAM, LL.D., American judge: b. South Carolina 1733; d. June 1790. He was educated for the bar in the Middle Temple, London, where he studied four years. He returned to America in 1754, and was appointed chief justice in the province of East Florida in 1768. During the War of the Revolution he was suspended from his office and reinstated in it, and went with his family for a time to England. After the peace he became successively judge of the admiralty court of South Carolina, associate justice of the state, and a judge under the federal government.

DRAYTON, WILLIAM HENRY: 1742, Sep.—1779, Sep. 3; b. Drayton Hall, S. C.: statesman. He was educated at Westminster School and Baliol College, Oxford, returned to the United States and studied law 1764, was admitted to practice, and shortly afterwards began publishing letters on current political topics. While in England, 1771, he was introduced to the king, who appointed him a privy councilor for S. C., Feb. 27. He returned, took his seat 1772, Apr. 3, was appointed assist. judge by Lieut. Gov. Bull 1774, Jan. 25, and was suspended from crown offices by Chief-Justice Gordon for presenting the draft of a bill of rights to the first continental congress. In 1775 he became a member and pres. of the council of safety, and pres. of the provincial congress; 1776, a privy councilor and chief-justice of the state; 1777, pres. pro. tem. of the state, and 1778, delegate to the continental congress. He left materials for a *History of the Revolution* which was edited and published by his son 1821.

DREAD, n. *drĕd* [AS. *dræd;* Sw. *rædas*, to fear: Sw. *rædd;* Scot. *rad*, afraid: OF. *dredré*, imitative of the chattering of the teeth]: great fear; apprehension of evil or danger; fear united with awe; the person or thing feared: ADJ. exciting fear; venerable in a very high degree; awful; terrible: V. to fear greatly; to be in great fear. DREAD'ING, imp. DREAD'ED, pp. DREAD'FUL, a. *-fûl*, inspiring dread; terrible. DREAD'FULLY, ad. *-lĭ*. DREAD'FULNESS, n. DREAD'LESS, a. *-lĕs*, fearless; undaunted. DREADNAUGHT, n. in *fabric*, a heavy woolen, felted cloth, used as a lining for hatchways, etc , on board ship; a kind of heavy goods for sailor's wear; a heavy overcoat or cloak made of dread-naught.—SYN. of 'dread, n.': awe; fear; terror; dismay; apprehension; affright; horror;—of 'dreadful': fearful; frightful; tremendous; horrid; horrible; terrific; formidable; awful; venerable.

DREAM, n. *drēm* [Icel. *draumr;* Ger. *traum*, a dream, slumber: Dut. *droom*, a dream: AS. *drefan;* OE. *dretche*, to disturb or trouble—in the latter, especially by dreams]: thoughts or ideas occupying the mind during sleep; a vain fancy: V. to have ideas or thoughts in the mind during sleep; to think or imagine; to see in a dream. DREAMFUL, a. full of dreams, fancies, or idle thoughts. DREAMILY, ad. as if heard in a dream, softly; gently; slowly; sluggishly; negligently. DREAM'ING, imp.: N. the act of one who dreams; the mind engaged with thoughts during sleep. DREAMED, *drēmd*, or DREAMT, pt. and pp. *drĕmt*. DREAM'Y, a. *-ĭ*, indistinct; full of dreams. DREAM'LESS, a. without dreams. DREAM'ER, n. one who; one lost in wild imaginations; a visionary. DREAM'INGLY, ad. *-lĭ*. DREAM'LESSLY, ad. *-lĭ*. DREAM-LAND, unreal events, or an imaginary country as pictured in dreams; region of fancies; fairy-land.

DREAM'ING: act or state of one whose mind is engaged with thoughts in sleep. In complete sleep, there is probably an entire absence of consciousness of external things. Usually, however, there is a certain amount of mental activity, of which the sleeper is more or less conscious at the time, and of which he has more or less subsequent remembrance. This is the state known as dreaming. Its chief feature is an '*absence of voluntary control* over the current of thought, so that the principle of *suggestion*—one thought calling up another, according to the laws of association—has unlimited operation.' The dreamer seems to perform all the actions of life; he experiences every kind of mental emotions, and sometimes his reasoning processes are remarkably clear and complete. Thus, when the mind, during sleep, takes up a train of thought on which it had been previously engaged during the preceding waking hours, intellectual efforts may be made during sleep impossible in the waking state. Such cases, however, are not common. To name two instances (quoted by Dr. Carpenter in his essay on Sleep in the *Cyclopædia of Anatomy and Physiology*): Condorcet saw, in his dreams, the final steps of a difficult calculation which had puzzled him during the day; and Condillac states that, when engaged with his *Cours d' Etude*, he frequently developed and finished a subject in his dreams which he had broken off before retiring to rest.

Occasionally, but not commonly, dreams seem to possess remarkable coherence and congruity in reference to the reasoning processes, or the combinations of the imagination. Most of our readers are probably acquainted with the incident narrated by Coleridge of himself, that his fragment, entitled *Kubla Khan*, was composed during sleep, which had come upon him in his chair while reading the following words in Purchas's *Pilgrims:* 'Here the Khan Kubla commanded a palace to be built, and a stately garden thereunto; and thus ten miles of fertile ground were inclosed within a wall.' Coleridge continued for about three hours apparently in a profound sleep, during which he had the most vivid impression that he had composed between

200 and 300 lines. The images, he says, 'rose up before him as things, with a parallel production of the correspondent expressions, without any sensations or consciousness of effort.' On awakening, he had so distinct a remembrance of the whole, that he seized his pen and wrote down the lines that are still preserved. Unfortunately, he was called away to attend to some business which lasted more than an hour, and on his return to his study, he found, to his intense mortification, that 'though he still retained some vague and dim recollection of the general purport of the vision, yet, with the exception of some eight or ten scattered lines and images, all the rest had passed away like the images on the surface of a stream into which a stone had been cast.' In other cases, a dream may leave a strong general impression on the mind, though particulars, even immediately on waking, cannot be recalled. Tartini is said to have composed the *Devil's Sonata* under the inspiration of a dream, in which the archfiend challenged him to a trial of skill. The dreamer lay entranced by the transcendent performance of his distinguished visitor; but on awakening and seizing his violin, though he was unable to reproduce the actual succession of notes, he produced from his general impressions the celebrated sonata.

Generally, however, dreams are wanting in coherence; all probabilities, and even possibilities of 'time, place, and circumstance' are violated. Friends long since dead appear and converse with us; and events long since past rise up before us with all the vividness of real existence. We may be conveyed to the antipodes, or even to worlds beyond our own, without the difficulty of the distance at all standing in the way. We are not aware of the grossest incongruities, probably because unable to test the probability of the phenomena by our ordinary experience; hence nothing that we see or do in a dream surprises us. Prof. Wheatstone observes, that 'we may walk along the brink of a precipice, or see ourselves doomed to immediate destruction by the weapon of a foe, or the fury of a tempestuous sea, and yet not feel the slighest emotion of fear; though during the perfect activity of the brain we may be naturally disposed to the strong manifestation of this feeling. Again, we may see the most extraordinary object or event without surprise, perform the most ruthless crime without compunction, and see what in our waking-hours would cause us unmitigated grief, without the smallest feeling of sorrow;' and Cicero, who long previously had made dreaming his study, justly remarks (*De Divinatione*, 59), that if it had been so ordered by nature that we should actually do in sleep all that we dream, every man would have to be bound down on going to bed. Occasionally, however, in place of this passive condition, the emotions may be highly excited; thus, for example, the sailor's wife is apt, especially in stormy weather, to dream of shipwreck, and to shriek with terror from its attendant miseries; and those who have once in their lives been exposed to some fearful danger, are apt to have the scene recalled to them in their dreams, either with all its appalling and lifelike

exactness, or possibly in a grotesque and impossible modification.

Although the predisposing causes of dreams may be sought for in more than one direction, they are probably in general referrable to some peculiar condition of the body, and are often called into action through the agency of the external senses. Dr. Gregory relates, that having occasion to apply a bottle of hot water to his feet at bedtime, he dreamed that he was walking up Mount Etna, and found the ground insufferably hot. Dr. Reid having had a blister applied to his head, dreamed that he was scalped by a party of Indians. M. Gizon de Buzercinges made a series of pre-arranged experiments, to test how far he could determine at pleasure the character of his dreams. In his first experiment, having allowed the back of his head to be uncovered during sleep, he thought that he was at a religious ceremony in the open air; the custom of the country in which he lived being to keep the head covered, except on some rare occurrences, among which was the performance of religious ceremonies. On waking, he felt cold at the back of the neck, as he frequently had felt at the real ceremonies. He repeated the experiment in two days with the same result. In a third experiment, he left his knees uncovered, and dreamed that he was travelling at night in the diligence; and travellers know, he observes, that it is chiefly at the knees that they feel cold in that conveyance at night.

One of the most remarkable phenomena of dreaming, is the rapidity with which long trains of thought pass through the mind. A dream requiring hours for its accomplishment, is begun and terminated in a few seconds. A person who was suddenly aroused from sleep by a few drops of water sprinkled in his face, dreamed of the events of an entire life in which happiness and sorrow were mingled, and which finally terminated with an altercation upon the borders of an extensive lake, in which his exasperated companion, after a considerable struggle, succeeded in plunging him. Dr. Abercrombie relates a similar case of a gentleman who dreamed that he had enlisted as a soldier, joined his regiment, deserted, was apprehended, carried back, tried, condemned to be shot, and at last led out for execution. After all the usual preparations, a gun was fired; he awoke with the report, and found that a noise in an adjoining room had both produced the dream and aroused him from sleep. Dr. Carpenter mentions the case of a clergyman falling asleep in his pulpit during the singing of the psalm before the sermon, and awakening with the conviction that he must have slept for at least an hour, and that the congregation must have been waiting for him; but on referring to his psalm-book, he was consoled by finding that his slumber had lasted not longer than during the singing of a single line. Sir Benjamin Brodie, in his *Psychological Inquiries* (1854), mentions the following anecdote of the late Lord Holland: 'On an occasion when he was much fatigued, while listening to a friend who was reading aloud, he fell asleep and had a

dream, the particulars of which it would have occupied him a quarter of an hour or longer to express in writing. After he woke, he found that he remembered the beginning of one sentence, while he actually heard the latter part of the sentence immediately following it, so that probably the whole time during which he had slept did not occupy more than a few seconds.' Many facts of the same kind are on record, and as the author from whom we have quoted remarks, 'if we were to pursue this subject, it would lead us to some curious speculations as to our estimate of time, and the difference between the real and the apparent duration of life.' It is from cases of this nature that Lord Brougham has been led to the opinion, that *all* our dreams really take place in the act of falling asleep or of awakening. We cannot, however, explicitly accept this doctrine: 1. There is no sufficient proof of it; 2. We have a proof to the contrary in the fact, that it is common for people to moan and even talk in the middle of a sleep; and every one who has kept a dog must frequently have observed him dreaming (from the outward manifestations which he makes in the form of snarling or growling), though he remains asleep. Some, on the other hand, have argued that the mind can never be entirely inactive, and that every one is dreaming through the whole period of sleep, though the dreams may not be remembered in the waking state.

Dreams have, in all ages and countries, been believed in as indications of the future; and of all forms of superstition, this is perhaps the most excusable. Whatever is mysterious as to its cause, and beyond the power of the will, appears as supernatural; and what more so than dreams! The thoughts in dreams, too, arise out of the past and present circumstances of the dreamer, and therefore are not altogether without connection with his future destiny, as most other omens are. In the Homeric age, it was firmly held that 'dreams come from Zeus.' In the most ancient civilized communities of which we have any record—those of Egypt and Babylon—to interpret the monarch's dreams was one of the most important state offices, and was confided to a college of wise men. A common way of consulting the Greek and Roman oracles (q.v.), was for the inquirer to sleep a night in the temple, after performing sacrificial and other rites, when his questions were supposed to be answered in dreams. Grave philosophers wrote treatises on the interpretation of dreams, as they did on astrology. Even Bacon, though he confesses that the interpretation of dreams is mixed with numerous extravagances, yet speaks as if he thought that something might be made of it. In modern times, and among European nations, dreams are seldom heeded except by the very ignorant or superstitious; and 'as idle as a dream' has become a proverb. As to the actual coincidences that sometimes happen between dreams and events, it is only surprising, considering the countless fancies that are passing through our minds while asleep, that the coincidences are not ten-fold more numerous than they are.

DREAR, a. *drēr*, or DREARY, a. *drēr′ĭ* [AS. *dreorig*; Ger. *traurig*, sorrowful: Icel. *dreyrigr*, gory]: dismal; gloomy; distressful. DREAR′ILY, ad. *-lĭ*. DREAR′INESS, n. *-ĭ-nĕs*, gloomy solitude. DREAR′IMENT, n. *-ĭ-mĕnt*, in *OE.*, sorrow; melancholy; dread.

DREDGE, v. *drĕj*, also DRADGE, n. *drāj* [Dan. *drysse*, to dredge, to sprinkle: OF. *dragée*, a power to aid digestion; F. *dragée*, small shot; prov. Dan. *drasse*, to fall with a pattering noise: Scot. *drush*, atoms, fragments]: to scatter flour, etc., on meat while it is roasting: N. a mixture of oats and barley sown together. DREDGING-BOX, a box used for scattering flour over meat—called a *dredger*. An apparatus for bringing up something from the bottom of a stream or body of water. It may be a light affair for dredging oysters or an enormous machine for deepening a channel.

DREDGE, n. *drĕj* [Dut. *dregghe*, a drag or grapple for sweeping the bottom of rivers, etc.: Dut. *dregnet*, a drag-net—from *dragen*, to bear, to carry: F. *drège*, a kind of net]: machine for dragging or dredging the bottom of seas, rivers, or lakes, in order to bring up oysters and other animals that lie on the bottom. The common oyster-dredge is a bag-net, made of iron rings, linked together to form the meshes; the mouth is of sheet-iron, which acts as a scoop when the dredge is let down and drawn along the bottom as the boat sails on. The dredge has of late been extensively used by naturalists with very important results, among the most remarkable of which are those obtained by the *Challenger* expedition, showing the existence of animal life in great variety at depths where it had before been considered impossible. The ordinary naturalist's dredge is of a lighter construction than that of the oyster-fisher, and its meshes are smaller. For dredging a sandy bottom, the best form is one like the net used by the Kentish shrimpers. These are twine nets, bag-shaped, and of the length of the boat. The lower side of the mouth of the net is stretched upon a wooden pole, and the other side is held up while the lower is drawn along the bottom. The quantity and variety of animals drawn up by these nets are astonishing. The dredge used for soles resembles the shrimp-net; but all dredges must be modified to suit the bottom on which they are used. See CHALLENGER EXPEDITION: ATLANTIC OCEAN: PACIFIC OCEAN: HYDROGRAPHY: SEA: SOUNDING, DEEP SEA.—DREDGE, v. to catch, take, or gather with a dredge; to deepen with a machine, as the bed of a river. DREDG′ING imp. DREDGED, pp. *drĕjd*. DREDGER, n. *drĕj′ĕr*, one who, or that which. DREDG′ING, n. the operation of deepening the bed of a river, canal, etc. DREDGING-MACHINE, machine for clearing out or deepening the channels of rivers, harbors, etc. They are variously constructed, the simplest being like the oyster-dredge, only having a perforated cowhide bag instead of the chain-net, and a stronger 'spoon' or iron mouth to the bag. This is attached to the end of a pole, and worked with

tackle by men from a barge in such a manner that the loose matter of the bottom is scooped up into the barge. The bucket dredging-machine is much more efficient. It consists of a long stage or frame-work overhanging the side of the barge. This frame has a wheel at each end, upon which works a powerful endless chain, to which is attached a series of perforated iron buckets, each with a shovel-shaped steel mouth projecting considerably on one side. The overhanging framework forms an inclined plane, along which the buckets run, descending on one side, and ascending on the other. They are so arranged that they descend empty, and on reaching the bottom, the projecting shovel or scoop-mouth digs into the bottom, and partially fills the bucket with the silt; it then turns round on the wheel at the lower end of the incline, and runs up it till near the top, when it turns over the upper end, and in doing so its contents are emptied into a second attendant barge. This action is continued by every succeeding bucket of the endless chain. The perforations are for the escape of the water. By varying the inclination of the framework, the working depth may be increased or diminished. Some dredgers are fitted with two complete sets of buckets, one on each side of the vessel. A steam-engine and boiler, suitably placed in the dredge-boat are provided for giving motion to the machinery, sometimes also to a screw-propeller placed at the stern. The Clyde at and below Glasgow is a notable instance of river-dredging; it has been converted from a river navigable only for small vessels into an estuary bearing the largest ships. The dredgers are moved by steam, and the materials scooped out are carried out to sea by lighters, which have a large open tank amidships, while the two ends are decked over, and afford such accommodation for crew or machinery; as may be necessary. The sides of the hold are hinged from the top, and open outward, and thus its contents can easily be emptied into the sea.

DRED SCOTT CASE: case of a slave, brought for final decision before the U.S. supreme court, 1856, which excited intensely earnest debate. The plaintiff was a negro named Dred Scott, who, with his wife and two children, had been held as slaves by Dr. Emerson, in Missouri. After the death of Emerson, Dred Scott with his family claimed to be free, on the ground that they had resided for some time with their late proprietor in a free territory—so that having, as Scott alleged, been free in that territory, they could not now be held to slavery. The result of the litigation, announced by Chief-Justice Taney, was, that Dred Scott and his family did not become free by having been taken to a free territory, and were accordingly still held to be slaves. The opponents of slavery denounced the law which could be open to such an interpretation, while public sentiment at the North was widely shocked by the terms used in setting it forth. The Dred Scott case was both indicative and preparatory of the tremendous conflict in which slavery went down.

DREE, v. *drē* [AS. *dreogan;* Icel. *drygja,* to endure]: in *old and prov. Eng.* and *Scot.,* to endure; to suffer. DREE'-ING, imp. DREED, pp. *drēd.*

DREEITE: see DREELITE.

DREELITE, n. *drē'līt* [after the Marquis de *Dree*]: one of the heavy spars, generally occurring as a whitish crystallized vein stone in lead mines.

DREGS, n. plu. *drĕgz* [Icel. *dregg,* sediment: Ger. and Dut. *dreck,* dung, dirt: OF. *drague,* draff]: the matter that settles at the bottom of a liquor; the sediment of liquors; lees; refuse matter; distillers' refuse used for cattle-feeding; the most vile and despicable part. DREGGY, a. *drĕg'gĭ,* muddy; containing dregs or lees. DREG'GINESS, n. foulness; fulness of dregs. DREG'GISH, a. full of dregs; foul with lees.—SYN. of 'dregs': dross; sediment; scum; dirt; mud; trash; feculence; grounds.

DREIBUND: see TRIPLE ALLIANCE.

DREICH, or DREEGH, a. *drēċh,* in Scotch, *ch* and *gh* guttural [Gael. *driachan,* slow]: in *Scot.,* tedious; slow.

DREISSENA, *drī-sē'na:* genus of lamellibranchiate mollusks, generally regarded as belonging to the mussel family (*Mytilidæ*); though, while the shell much resembles that of the true mussels, the animal differs in having the mantle closed except at the anal and branchial slits, and a small aperture through which the foot and byssus protrude. —*D. polymorpha* is an interesting mollusk, because, having of late been accidentally introduced into British estuaries and canals, it has fully established itself, and is now abundant in many of them, and in the rivers with which they are connected. Originally, it is believed, a native of the rivers which flow into the Caspian Sea and Lake Aral, it has extended to the canals and rivers of Germany, Holland, etc. It is capable of living a long time out of water with its valves closed, and it is supposed that it may have been brought to Britain on timber imported from the continent.

DREMOTHERIUM, n. *drĕm-o-thēr'ĭ-ŭm* [Gr. *dramein,* to run, and *therion,* a beast]: in *paleon.,* genus of animals allied to the musk-deer, found in the Miocene deposits of France and Africa.

DRENCH, v. *drĕnsh* [Icel. *dreckia,* to plunge in water: Sw. *dranka,* to plunge in water, to drown; Dut. *drencken,* to water beasts]: to wet thoroughly; to soak; to saturate; to purge violently: N. a dose of liquid medicine for purging a horse; a draught. DRENCH'ING, imp. DRENCHED, pp. *drĕnsht.* DRENCHER, n. *drĕnsh'ĕr,* one who or that which. DRENCHING-APPARATUS, n. a jaw-opener and head-lifter by which drenches may be administered to animals without their being able to bite the bottle or horn, or the arm of the operator. DRENCHING-HORN, n. a cow's horn, closed at the butt-end and perforated at the point-end (like a powder-flask), to administer drenches of medicine to ailing animals.

DRENTHE, *drĕn'tĕh* or *drĕn'tā:* frontier province of the Netherlands; bounded on the e. by Hanover, on the n. and e. by Groningen, on the w. by Friesland, and on the w. and s. by Overyssel; lat. 52°37′—53° 23′ n., and long, 6° 12′—7° 10′ e., 1,030 sq. m. The soil is in general poor, only about one-half of the surface being capable of cultivation, the remaining portion covered chiefly with heath and morass. The principal crops are rye and buckwheat, but barley and oats also are raised. The inhabitants are employed chiefly in agriculture, pasturage—the cattle reared in Drenthe being famous—and in digging and exporting peat. Two pauper colonies in the west of the province, the Fredericksoord and Willemsoord, established 1818, are employed by the state in bringing waste land under cultivation, and in brick-making, weaving, and other occupations. Pop. (1901) 153,281.

DREPANOPHYLLUM, n. *drĕp-a-nŏ-fĭl'lŭm* [Gr. *drepanon*, a sickle, a reaping-hook, and *phullon*, a leaf]: in *bot.*, a genus of terminal fruited mosses, the typical one of the family *Drepanophylleæ.*

DRESDEN, *drĕs'dĕn* or *drĕz'dĕn:* capital of the kingdom of Saxony, in a charming valley on both side of the Elbe; lat. 51° 3′ 16″ n., and long. 13° 44′ e. It is 116 m. s.e. of Berlin, and 72 m. e.s.e. of Leipsic. It is composed of the Altstadt (Old Town), on the left bank of the Elbe; and of the Neustadt (New Town), on the right or n. bank. Dresden is a pleasant, though not exactly a beautiful town. There are several open squares in both the Old and New Towns. On account of its architecture and splendid collections in art, it has been justly called the 'German Florence.' Of the churches, the finest are the Frauenkirche, with a tower 335 ft. in height; the Rom. Cath. Church (1737–56), with a celebrated organ by Silbermann, and numerous statues and pictures; the Sophienkirche; and the Kreuzkirche, with an altarpiece by Schönau. The synagogue of the Jews, built in the oriental style by Semper, also is worthy of mention. Among important buildings are the Royal Palace, a shapeless edifice, begun by Duke George 1534, and completed by Augustus II.; the Prince's Palace erected by Augustus II. 1718; the Zwinger, only the vestibule of a palace in the almost too elaborate old French style of architecture, but containing many valuable antiquarian and scientific collections; the theatre, the academy, the Brühl Palace, etc. The Old and New Towns are connected by two bridges, both *chefs-d'œuvre* of architecture.

Dresden possesses many excellent educational and charitable institutions. The Acad. of Art was opened 1764; a school of architecture was added 1819. This celebrated institution and the musical choir give the city an artistic eminence.

The most important branches of industry are gold and silver manufactures, machinery, strawplait, paper-hangings, excellent painters' canvas, colors, artificial flowers, chocolate, porcelain, etc. An impulse was given to the

corn-trade by the opening of the Corn Exchange in 1850. The environs of Dresden are delightful.

The most important of the Dresden collections are: 1. The Royal Public Library in the Japan Palace, with nearly 350,000 vols. It contains many curiosities, and is complete particularly in the department of literary history and classical antiquity, as well as in histories of France and Germany. 2. The Cabinet of Coins, likewise in the Japan Palace. 3. The Museum of Nat. History in the Zwinger, complete particularly in the mineralogical department. 4. The Historical Museum, formed 1833. 5. The collection of mathematical and physical instruments, likewise in the Zwinger. 6. The renowned Picture-gallery, containing upward of 1,500 paintings, mainly by Italian and Flemish masters. Among the former, those especially worthy of notice are the pictures of Raphael (*The Sistine Madonna*); of Correggio (*La Notte*, and the *Madonna of St. Sebastian*): of Titian (*The Tribute-money*, and *The Venus*); of Andrea del Sarto (*Abraham's Sacrifice*); of Francia; of Paul Veronese; of Giulio Romano (*The Virgin with the Pitcher*); of Leonardo da Vinci (*Francesco Sforza*); of Gaorfalo, Bellino, Pietro Perugino, Annibale Caracci, Guido Reni, Carlo Dolci, Cignani, etc. Of the Flemish school, the collection has 41 pictures by Rubens, 21 by Vandyck, many by Rembrandt, admirable specimens of Snyders, Johann Breughel, Ruysdael, Wouvermann, Gerard Dow, Teniers, etc. Of works of the German school, the gem of the collection is Hans Holbein's Madonna. Of the French school, several pictures by Nicolas Poussin and some admirable landscapes by Claude Lorraine, are most remarkable. 7. The cabinet of Engravings in the Zwinger, arranged in 12 classes, marking distinct periods in the history of art. 8. The collection of Antiques in the Japan Palace, including several admirable sculptures. 9. The *Green Vault* in the Royal Palace, a valuable collection of precious stones, pearls, and articles wrought in gold, silver, and ivory. 10. The collection of Porcelain in the Japan Palace.

Dresden is known in history as far back as 1206. It is officially mentioned as a town 1216. Henry the Illustrious selected it for his capital 1270. From the close of the 15th c., its prosperity gradually increased. Several successive sovereigns contributed to its embellishment, particularly Augustus I. and Augustus II. It suffered severely, however, during the Seven Years' War; and again, 1813, when Napoleon selected it as the central point of his operations. During the revolution of 1849, also, immense damage was inflicted upon the town, but it is again rapidly improving. Dresden was occupied by the Prussians in 1866 during the Austro-Prussian war. Since that year the city has been enlarged and made more delightful, new streets have been opened, old irregular buildings have given way to handsome and imposing edifices. The foundation stone of the magnificent new Court Theatre was laid 1871. **Pop.** 396,146.

DRES'DEN, Battle of: between Napoleon and the allies, 1813, Aug., when the war, after a short truce, broke out afresh, the armies of the allies gathered from all sides toward Dresden, which they regarded as the key of the French position. It was held by St. Cyr with a force of about 30,000 men, the main body of the French under Napoleon being in Silesia, where the emperor expected the contest was to be waged. Aug. 23, the grand army of the allies appeared before Dresden. The town would in all probability have been quickly stormed, had not Schwarzenberg and the Austrians insisted on waiting the arrival of the left wing under Klenau. This delay saved the French; for on the 26th, at half-past nine in the morning, Napoleon with his Guards entered the town. At four in the afternoon, Schwarzenberg, commander-in-chief of the allies, gave orders for the attack. At various points the assault was irresistible, but the opportune arrival of the 'Young Guard' enabled Napoleon to hazard a sally, as unexpected as it was successful. The allies fell back everywhere; but not dispirited, renewed the fight next day. Toward noon, Moreau was mortally wounded by a cannon-ball at Alexander's side on the height of Räcknitz, and Napoleon obtained a decided advantage over the left wing of the allied army, which Murat, by a skilful maneuver, contrived to outflank, taking 10,000 prisoners, among whom was General Metsko. Several other successes in other parts of the field determined the allied armies, especially after hearing that Vandamme was advancing toward Pirne, to retreat, which they did during the night of Aug. 27. Dresden, however, was not yet delivered from the miseries of war. When Napoleon finally quitted the city, Oct. 7, nearly 30,000 men still remained behind. As all access was cut off by the Russians, the city suffered severely from famine. A capitulation was at length brought about (1813, Nov. 11) between St. Cyr and Klenau, according to which the garrison were to withdraw unmolested, from Nov. 12–16, on condition that they laid down their arms. The capitulation was nevertheless rejected by Prince Schwarzenberg, the garrison declared prisoners of war, and treated as such. The battle of Dresden, as Alison observes, was the *last* pitched battle, on a scale commensurate with his former victories, that Napoleon ever gained.

DRESS, n. *drĕs* [F. *dresser*, to make straight, to trim—from It. *drizzare*, to dress or run toward a place: Gael. *dreach*, to dress: L. *dirigĕrĕ*, to direct]: covering or ornaments for the body; garments; clothes; a lady's gown: V. to cover the body with clothing or ornaments; to deck, adorn, or embellish; to cultivate; to prepare food for the table; to put into good order, as a wound; to prepare or fit for use; in *mil.*, to adjust the front of a company to a straight line. In *fabrics*, to size yarn, cloth, or thread; to teazle or raise the nap on woolen cloth; in *print.*, to arrange the form in the chase symmetrically; in *mill-work*, to prepare the surface of a mill-stone; in *masonry*, to prepare or smooth

the surface of stonework; in *min.*, to prepare mineral ores for the furnace; in *metal*, to planish sheet-metal ware into symmetrical form on a stake or anvil. DRES'SING, imp. DRESSED, pp. *drĕst*. DRESS-COAT, n. a swallow-tailed coat, or one with narrow pointed tails, worn by gentlemen in evening dress. DRESS GUARD, n. a wing at the side of the carriage door, to prevent the brushing of the dress against the wheel. DRES'SER, n. in *Scot.*, one who; a large table or bench in a kitchen, on which things are dressed for use. DRES'SING, n. a preparation to fit for use; an application made to a wound; in *arch.*, loosely applied to moldings and all the simpler sculptured decorations. DRESSING, n. gum, starch paste, clay, etc., used in the sizing of fabric, yarn, or thread; in *cook.*, the stuffing of fowls, etc.; force-meat; in *foundry*, the act or process of clearing castings after they have been taken from the mold; in *type-found.*, the cleaning and notching of the letters after casting; in *familiar language*, a flogging or beating; in *OE.*, ornament; attire. DRESSING-BENCH, n. a bricklayer's bench, having a cast-iron plate on which the sun-dried brick is rubbed, polished, and beaten with a paddle in order to make it symmetrical. DRES'SY, a. *-sĭ*, showy in dress. DRESSING-CASE, a box fitted with toilet requisites. DRESSING-GOWN, an easy loose gown used in the morning before or while dressing. DRESSING-ROOM, an apartment in which a person may dress. DRESSING-TABLE, a table at which a person may dress, and on which articles for the toilet stand. DRESS-MAKER, n. one who makes ladies' dresses. TOP-DRESSING, matter, as manure, applied to land not ploughed in.—SYN. of 'dress, n.': attire; array; apparel; clothing; vesture; vestment; raiment; costume; habit; accoutrements; robes;—of 'dress, v.': to rig; trim; prepare; arrange; align; adjust; decorate.

DRESS: collective name for the artificial coverings worn in greater or less quantity by all but the most savage of the human race, and always combining the two objects of warmth and ornament. It seems, indeed, from what is known of savage nations, that it is rather in the desire for ornament that the wearing of Dress begins, than with a view to protection from cold (see FASHION, for some of the more singular caprices to which Dress has been subjected; see also CRINOLINE: BLOOMERISM). The earliest coverings consisted of such articles as the skins of animals, and the leaves and inner bark of plants, which, as civilization advances, were mostly supplanted by various textures of wool, flax, silk, and other vegetable and animal substances. See HEALTH.

DRESSER, HORATIO WILLIS, American author: b. Yarmouth, Maine, 1866, Jan. 15. After a varied career he became identified with one of the so-called 'new thought' movements, of which he is now a prominent representative. Since 1893 he has lectured and written extensively on practical philosophy and metaphysics, and he edited and published the *Journal of Practical Metaphysics* (1896–8);

but it must be pointed out that these terms, as used by him and his school of thought, have meanings entirely different from those in which they have hitherto been used and are generally understood. He is the author of: *The Power of Silence* (1895); *The Perfect Whole* (1896); *In Search of a Soul* (1897); *Voices of Hope* (1898); *Methods and Problems of Spiritual Healing* (1899); *Education and the Philosophical Ideal* (1900); *Living by the Spirit* (1900); *Voices of Freedom* (1899–1900); *The Christ Ideal* (1901); *A Book of Secrets, with Studies in Self-control* (1902); *Man and the Divine Order* (1903). He has been assistant professor at Harvard since 1903.

DREUX, *drëh:* ancient town of France, dept. of Eure-et-Loir, on the river Blaise, 22 m. n.n.w. of Chartres, 45 m. w. of Paris. It is moderately well built, at the foot of a hill crowned with the dilapidated ruins of an ancient castle, formerly the possession of the Comtes de Dreux. From among the ruins rises a beautiful chapel, in the form of a Greek temple, surmounted by a cupola, erected by Louis Philippe. It contains the tombs of two of the children of Louis Philippe, and of others of his relations. The town-hall and the parish church, both handsome specimens of Gothic, are the only other buildings worthy of note. Dreux has extensive manufactures of coarse cloth, serge, etc., with a trade in sheep and cattle, also various tan-yards, iron-foundries and dye-houses. In 1562, one of the bloodiest battles in the religious wars of France took place at Dreux, in which the Roman Catholics, under the Constable Montmorency, defeated the Huguenots. Pop. (1901) 9,697.

DREW, n. *drū* [prob. from Icel. *druar*, long, drawn out]: species of sea-weed, the narrow thong-shaped sea-weed, *Fucus loreus;* sea-laces, *Fucus* (now *Chorda*) *filum.*

DREW, Daniel: 1797, July 29—1879, Sep. 18; b. Carmel, Putnam co., N. Y.: capitalist and speculator. In early life he was a cattle-drover, and after saving some money began building and operating steamboats on the Hudson river. Subsequently he became prominent in various railroad enterprises, particularly the Erie railroad, of which he was treas. for a time, and was afterward one of the most widely-known stock operators in Wall st. The latter part of his life he lost heavily by adverse stock operations and the failure of the firm of which he was a partner, and was forced to assign and go into bankruptcy. In his prosperous days he founded the Drew Ladies' Seminary at Carmel, N. Y., and the Drew Theol. Seminary (Meth. Episc.) at Madison, N. J., giving to the latter nearly $1,000,000. He gave also a handsome sum to Wesleyan Univ., Middletown, Conn.

DREW, John: American actor: b. Philadelphia, 1853, Nov. 13. He is a son of the preceding and first appeared in his father's theatre in that city, and for a short season played there with Edwin Booth. He visited Europe in

1892 with Daly's company, playing classic roles and began his starring tours in the autumn of 1892, playing in *The Masked Ball*. In 1901 he reduplicated some of his earlier successes in *The Second in Command*.

DREW THEOLOGICAL SEMINARY: at Madison, N. J.; founded as a theol. school of the Meth. Episc. Church by a gift of $500,000 from Daniel Drew, 1866. A valuable piece of property belonging to the Gibbons estate and known as 'The Forest' was purchased, the commodious mansion slightly altered, and the institution opened 1867, Nov. 6, with John McClintock, D.D., LL.D., as pres. and prof. of practical theol., and Bernard H. Nadal, D.D., LL.D., as prof. of historical theology. Pres. McClintock died 1870, Mar. 4, and Prof. Nadal became acting pres., but lived only till June 20. Randolph S. Foster, D.D., the prof. of systematic theol., was then appointed pres. and served as pres. and prof. till 1872, May, when he was elected a bp. of the Meth. Episc. Church. He was succeeded by John Fletcher Hurst, D.D., prof. of historical theol., who was chosen 1873 and served till 1880, when the gen. conference of the church a second time honored the seminary by electing its pres. to the episcopacy. After Bishop Hurst's resignation, Henry Anson Buttz, D.D., LL.D., the George T. Cobb prof. of New Test. exegesis, was chosen pres. and still occupies the office (1906). The lib'ry contains 85,000 vols. The resident professors and instructors (1905-6) were 8, students 175 and the alumni 1,159.

DREXEL, *drĕx'l*, Anthony Joseph, American banker: b. Philadelphia, Pa., 1826; d. Carlsbad, Germany 1893, June 30. He became the head of the well-known firm of Drexel & Company, of Philadelphia, with which he had been identified from the age of thirteen. He contributed largely to philanthropic and educational interests, and was zealous in promoting science and art, especially that of music. The Drexel institute of Science and Art was founded by him in 1891, the original cost of the building amountings to $600,000, with an endowment fund of $1,000,000, which were subsequently increased to $4,000,000 and $2,000,000 respectively.

DREXEL INSTITUTE OF ART, SCIENCE AND INDUSTRY: founded in 1891 by Anthony J. Drexel (q.v.), for the purpose of giving young men and women opportunity to acquire training in the arts and sciences as applied to industries. No degrees are given, and the requirements for admission depend upon the course which the applicant wishes to pursue. The buildings and equipments, given by Mr. Drexel, cost over $4,000,000; and the amount of endowment, given also by him, is $2,000,000. The courses offered are: Fine and applied arts; elective engineering; commerce and finance; mechanical drawing and machine construction; domestic science; mathematics; physics; chemistry; and English. Day and evening classes are provided for all depart-

ments. It provides a liberal and practical course of study for a two years' training in the knowledge of the world's industries and markets, the laws of trade and finance, and the mechanism and customs of business. In 1895 a beginning was made toward the formation of a permanent commercial museum. The collection now represents quite fully the following industrial products: Flour, wool, petroleum, tea, coffee, sugar, cotton, copper, iron and steel, glass, tobacco, leather, paper, wood, carpets, linen, spices, aluminum, building stone, brick and terra-cotta. The art museum contains collections representing the industrial arts of Egypt, India, China, Japan, and Europe. The library contains about 30,000 volumes.

DREYFUS, *drā'füs*, ALFRED: French military officer: b. 1859; was trained in the Polytechnic School, Paris, and made a lieutenant of artillery, 1882; promoted captain, 1889. He was arrested 1894, and accused of selling military secrets to Germany and Italy. On 1895, Jan. 5, he was convicted and in the presence of 5,000 troops was degraded from his rank. He was then conveyed to the Isle de Diable, off the coast of French Guiana, under a sentence to serve a life imprisonment. In 1899 he was granted a new trial by court-martial, but was again convicted. He was, however, almost immediately pardoned. In 1900 his request that an inquiry be made concerning a new charge that he had written to Emperor William was refused. On July 12, 1906, the Supreme Court of France, having made an exhaustive examination of the evidence bearing on his case, decided that there never had been any ground for charges against him, and in order to wipe out the stain of the false accusations which had led to his conviction and punishment, as well as to make reparation as far as lay in its power for the wrongs which had been inflicted upon him, proclaimed that he needed no new trial as a preliminary to his rehabilitation, as there was no incriminating evidence against him, and ordered his immediate reinstatement in the army. The court likewise directed that its mandate should be transcribed in the records of the Rennes court-martial, published in the official journal and five newspapers to be selected by the procurator-general, and at the government's expense, in fifty newspapers in France and the provinces, of Dreyfus' own selection. Immediately following his reinstatement he was promoted to the rank of major and decorated with the legion of honor, while legal steps were taken for the punishment of those who had conspired against him. A more complete and sweeping vindication probably was never given an innocent man. He published *Five Years of My Life* (1901).

DRIFT, n. *drĭft* [AS. *drifan;* Goth. *dreiban,* to move under the influence of an overpowering force: Icel. *drif,* a tempest: Dut. *drift,* a flock, course, current: Ger. *trift,* a drove]: that which is driven by wind or water and collected in heaps; overbearing power or influence; tendency; aim or

scope; in *mining*, a passage cut between shaft and shaft, called the *driftway;* in *navigation*, deviation of a ship's course through the action of a contrary wind or current; in *arch.*, the push, shoot, or horizontal thrust of an arch or vault upon the abutments; in *ord.*, a priming-iron to clean the vent of a piece of ordnance from burning particles after each discharge; in *mach.*, a round piece of steel, made slightly tapering, and used for enlarging a hole in a metallic plate by being driven through it; in *pyrotech.*, a stick used in charging rocket-cases; in *ship-build.*, drifts in the sheer draft are where the rails are cut off and ended with a scroll. Pieces fitted to form the drifts are called drift-pieces; difference in size between a treenail and its hole, or a hoop and the spar on which it is driven; part of the upper strake between the coach and the quarter-deck; in *Scot.*, a drove, applied as to sheep; in *geol.*, unstratified boulder soils and clay, a deposit of the Pleistocene epoch; called the Northern Drift, Glacial Drift, or Diluvial Drift, in allusion to its supposed origin (see BOULDER-CLAY): V. to be driven into heaps, as snow or sand; to be driven along by a current of water, as, the *ship drifts;* to drive into heaps. DRIFT'ING, imp. DRIFT'ED, pp. DRIFT-ANCHOR, n. *naut.*, a triangular frame of wood or other similar contrivance, having just sufficient buoyancy to float, to which a line that leads from the stern of the ship is attached. It keeps a dismasted vessel's head to the wind, or any vessel when it is impossible to carry sail. DRIFT-NET, n. a fishing-net about 120 ft. long and 20 ft. deep; corked at the upper edge. Several of these may be connected lengthwise and attached to a drift-rope: the meshes $2\frac{1}{2}$ in. or more, according to the size of the fish. DRIFT-PIECE, n. in *ship-build.*, one of the upright or curved pieces of timber that connect the plank-sheer with the gunwale. DRIFT-PIN, n. a hand tool of metal driven into a hole to shape it; as the drift which makes the square socket in a watch-key. DRIFT-SAIL, n. a sail dragging overboard to diminish leeway; a drag or drag-anchor. DRIFT-BOLTS, steel bolts used to drive out other bolts. DRIFT-WIND, a wind that drives all before it. DRIFT-WOOD, wood carried by a current of water; specimens thus transported have been found in the marine strata of the Chalk, London Clay, and other formations. BOREAL-, DILUVIAL-, and GLACIAL-DRIFT, names for the drift of the glacial or ice period. SPINDRIFT, n. *spĭn'*-, in *Scot.*, the snow when drifted from the ground with a whirling motion.

DRIFT, n. *drĭft* [Dut. *drift*, a flock or herd—*lit.*, that which is driven, hence the road over which driven]: in *s. Africa*, a practicable ford over any river or stream, whether on rock or silt.

DRIFT-SAND, or SAND-DRIFT: sand driven and accumulated by the wind. Deposits thus formed are found occasionally among the stratified rocks, but compared with other strata they are few, though, from their anomalous character, an acquaintance with their phenomena is important to the geologist. Moving sands are at the present day, in many places, altering the surface of the land. In

the interior of great dry continents, as Africa, India, and Australia, extensive districts are covered with moving sands. The continuous blowing of a steady wind in one direction often covers a rich tract with this arid material. But the influence of the wind on loose sand is most evident along low sandy coasts, where hills, called 'dunes,' are formed entirely of it; they sometimes attain considerable height, as 200 or 300 ft. Dunes (q.v.) are advancing on the French coasts of the Bay of Biscay at the rate of about 60 ft. per annum, covering houses and farms in their progress. Similar accumulations are forming on the coasts of Nairn, Cornwall, Wexford, and other parts of the British Isles. The Culbin Sands, in Nairnshire, cover a large district which at a period not very distant was rich arable land. The prevailing wind is from the w., hence the hills are slowly moving easterly, at the rate of a mile in somewhat less than a hundred years. A singular stratification exists in these hills. The prevailing west wind lifts, or rather rolls the particles of sand up the gentle incline of the w. aspect of the hill, until they reach the summit, where they fall, forming a steep declivity to the e., equal to the angle of repose for sand. A shower consolidates the surface of the new bed, or a land breeze carrying fine dust separates it by a very thin layer of finer material from the one that follows, and thus, as the hill moves eastward, a series of strata is formed. The progress of the hill is represented by the dotted outline. Little can be done to arrest the progress of these devastating sand drifts. It has been recommended to plant *Carex arenaria* and similar sand-loving plants, which have long creeping roots; they certainly check to a considerable extent the influence of the wind.

Downs (q.v.) are less barren than dunes, being composed not so entirely of sand.

DRILL, n. *drĭl* [primary signification, as in *thrill*, *trill*, *thirl*, a shivering, a turning round, and hence a piercing: Dut. *drillen*, to shake—also applied to the brandishing of weapons: old Dut. *drille*, a hole: comp. Gael. *druil*, to twirl, to roll together: F. *driller*, to glitter]: a pointed instr. for boring holes; the act of training in military exercises and use of arms: V. to pierce or bore with a drill; to train as a soldier by military exercises; to educate by repeated acts. DRILLING, imp. N. the practice or training in military movements and use of arms; the act of practicing in mechanical arts, etc., in order to render efficient and skilful. DRILLED, pp. *drĭld*. DRILL-BOW, a small bow for rapidly turning a drill. DRILL-CHUCK, n. a chuck in a lathe or drilling machine for holding the shank of the drill. DRILL-JAR, n. a form of stone or well-boring tool in which the tool-holder is lifted and dropped successively. The drill-rod is raised sufficiently between each impulse to loosen the tool from its impression in the stone, and is then dropped to give a blow to the tool. DRILL-PIN, n. the pin in a lock which enters the hollow stem of a key. DRILL-SERGEANT, a non-commissioned

officer who trains soldiers. DRILLMASTER, one who teaches drill by way of gymnastics.—*Drill*, is subject to numerous varieties, according to the number and organization of the men drilled at one time, and the kind of weapon to which the exercises relate. It is considered that four months' drill is required to fit an infantry recruit for service.

DRILL (*Cynocephalus leucophæus*): species of baboon (q.v.), native of Guinea, similar to the mandrill, but rather smaller and less ferocious.

DRILL, fine linen fabric of a satiny finish, used for summer dresses for gentlemen. Drills are worked with five shafts, except fancy patterns, which are wrought with eight shafts.

DRILL, in Mechanics· tools used for boring or drilling holes in metal, bone, ivory, hard woods, etc. They usually are made of a square steel bar, flattened out at the cutting end; this part is brought to an angular point like a spear-head, and the cutting edges forming the angle are bevelled in the opposite directions. Those which have a projecting pin in centre, and chisel-shaped cutting edges on each side of the pin, are called 'centre bits.' There are various contrivances by which the drill is made to revolve. For drilling iron, steel and large brass work, the lathe is commonly used, the drill being fitted into a square-hole chuck, and the work pressed against it while revolving by the screw and centre of the puppet. The *brace* or *drill-stock* is commonly used by carpenters for centre bits, and occasionally for metal work; this is a curved handle, made to revolve by the hand, while one end is pressed against the chest. Small drills for metal work are mounted with a *ferule* or pulley, or are fitted into a stock with such a pulley on it; a piece of cane or spring-steel is mounted with a string like an archer's bow, but loose enough to wind round the ferule. By drawing the bow lengthwise, the drill is made to revolve, and is at the same time pressed against the work by means of a *breast-plate*, held against the chest of the workman; this breast-plate has indentations upon it, which serve as sockets, into which the end of the drill-stock or drill works.

DRILL, v. *drĭl* [Gael. *drill*, a drop: W. *dryll*, a fragment: Sw. *dralla*, to scatter, to sow: W. *rhill*, a row or trench]: to let corn dribble along a furrow or channel like a trickling rill of water: N. in *agriculture*, a row of grain or seed sown or planted in a furrow; the trench or channel so sown. DRIL'LING, imp. DRILLED, pp. *drĭld*. DRILL-BOX, the box containing the seed for sowing. DRILL-GRUBBER, -HARROW, and -PLOW, instruments used in drill husbandry. *Note.*—As a matter of fact, the dribbling of the corn along the furrow has the appearance of the trickling of water. Without doubt, however, the primary idea was the dotted appearance of the seeds in a row, as if *drilled holes*, then applied to the furrow or channel sown with corn.

Drill in agriculture is a small furrow for receiving seed, a row of plants grown in such a furrow, or a machine for

depositing seed in rows; *drilling* is the method of sowing or planting seed in regular rows instead of broadcast or in hills. In a rude fashion drilling was practiced by the Chinese, Hindoos, and other ancient peoples both for the growing of garden plants and for the production of field crops. While it possesses marked advantages, the system has never been generally adopted, even in the most progressive countries, though of late it has been rapidly growing in popular favor. In England one or more machines for drilling grain had been invented earlier, but the first really practical implement for the purpose was constructed by Jethro Tull about 1701. A strong prejudice against innovations, together with the complicated nature and great expense of the machines, prevented their use to any extent until a much later period. Though using the same leading principles, modern drills are much simpler, are better made, and are furnished at very moderate prices.

The principal objections to drilling grain are the necessity of having fields smooth and free from large stones and other obstructions, the extra amount of time and labor required in fitting the land to receive the seed and the cost of the machines. But, except on unusually rough land, these drawbacks are offset by very great advantages.

Among the merits of this system may be mentioned the great economy of seed. In the broadcast method of sowing much of the seed remains upon the surface of the ground, where it falls a prey to birds or mice; or is so slightly covered that it cannot germinate and is consequently wasted. In drilling wheat or similar grains, only about one-half the quantity of seed is required that is needed if scattered broadcast. When seed is sown broadcast by hand it is unevenly distributed. In some places it will be thick, in others thin. In the thickly sown spots one plant interferes with the growth of its neighbor, while in the thin places weeds are almost certain to appear. With a good seed drill these evils are avoided. The machine can be readily gauged to sow the exact quantity of seed per acre desired and perfect regularity in its distribution is assured. Another evil inseparable from broadcast sowing, even when the best machines for sowing and covering are employed is found in the unequal depth at which the seed is lodged in the earth. By the use of the drill perfect uniformity in this respect is secured. The seed being buried at the same depth will germinate at the same time, the plants will make a uniform growth, and come to maturity at the same period. But grain scattered broadcast will grow and ripen unevenly and the quality of the product, particularly in the case of wheat and barley, will be injured by this lack of uniformity. Another advantage in drilling grain is found in freer admission and circulation of heat, air, and sunlight, which it insures and which causes a vigorous growth and increases the ability of the plants to withstand attacks of insects or diseases. The straw also grows much stronger and the falling down, or 'lodging,' of the grain by which many crops on rich soils are injured, is in a great measure prevented. Grain that

is drilled will tiller much more than that which is sown broadcast, the stalks will grow taller and the heads will be longer and heavier, the yield of grain will be larger and the quality decidedly better. Drilling also admits of the cultivation of grain during the period of its growth. This is impossible where broadcast sowing is followed. Yet cultivation is probably as beneficial to grain as to the planted crops to which it is invariably given. It promotes the rapid growth of the plants, tends to prevent injury from drought, and destroys many weeds which, if left to mature, would injure the crop, rob the soil, and fill the land with foul seeds, occasioning much trouble in after years.

In England, where drill husbandry has made much greater progress than elsewhere, machines of various sizes and patterns, some very elaborate and expensive, have found considerable sale. In this country several admirable styles of drills, sowing from three to nine rows at a time, are manufactured, and are in considerable demand. Of these a very few are combined seeders and cultivators, allowing the seed to be sown and the plants cultivated with a single machine. As the population becomes more dense, and the necessity of utilizing the land in the best possible manner grows more imperative, the drilling of grain will, to a great extent, take the place of the imperfect methods of seeding which have thus far prevailed.

DRIMYS: see WINTER'S BARK.

DRINK, n. *drĭngk* [Goth. *drigkan;* Icel. *drecka;* Dan. *drikke,* to drink: Icel. *dreckia,* to sink under water]: any liquid taken into the mouth and stomach for quenching thirst; a beverage; a draught; a potion: V. to swallow a liquid, as water; to suck in; to absorb; to take alcoholic liquors; to be intemperate. DRINK'ING, imp.: ADJ. pertaining to the use of intoxicating liquors: N. the act of swallowing or absorbing; the practice of partaking to excess of intoxicating liquors. DRANK, pt. *drăngk.* DRUNK. pp. *drŭngk,* intoxicated. DRUNKEN, a. *drŭngk'ĕn,* intemperate. DRINK'ER, n. one who drinks. DRINKER-MOTH, n. in *entom.,* a popular name for *Odonestis potatoria,* a genus of large moths belonging to the family *Bombycidæ:* see SILK and SILKWORM. It derives its name from the palpi, which are long, forming a beak in front. It is of a dull reddish or yellow color. DRINKING-BOUT, n. a set-to at drinking; a revel. DRINK IN, to absorb; to receive with avidity, as through hearing or sight. TO DRINK OFF, to drink the whole at a draught. TO DRINK TO, to salute or wish well to any one accompanied by drinking liquor. TO DRINK UP, to drink the whole. DRINK'ABLE, a. *-ă-bl,* fit or suitable for drinking. DRINK'ABLENESS, n. *-bl-nĕs.* DRINK-OFFERING, an offering of wine, etc., in the religious services of the Jews. *Note.*—DRINK is connected with *drench* and *drown:* prov. Eng. *drake* or *drack,* to wet thoroughly.

DRINK'ING USAGES: social or religious customs in partaking of wine or strong drink; connected with the history of manners. Some of them are of great antiquity. Besides sacrifices of animals and articles of food, the He-

brews made drink-offerings a solemn religious service. To mark the spot were Jacob communed with God, he set up a pillar of stone, and 'poured a drink-offering thereon.'—Gen. xxxv. 14. Such sacrifices were not made to the true God alone; for women are said to have poured out 'drink-offerings unto other gods.'—Jer. vii. 18. Such a statement is amply verified by pagan writers. Among the Greeks and Romans, the pouring out of a libation to the gods was a common religious observance. A libation was made on the occasion of solemn prayers, also before meals: these libations were usually of undiluted wine, but they were also sometimes of milk diluted with water, or water flavored with honey. There are many references to these libations by Sophocles, Æschylus, Pliny, and other writers. The libation at meals consisted of pouring a small quantity of liquor from the cup on the ground—so much waste being a kind of propitiation, or an act somewhat equivalent to the asking of a blessing. See SACRIFICE.

From these and similar usages in remote times sprang the ceremonial observance of drinking healths, or the uttering of a pious, heroic, or friendly sentiment before quaffing liquor on festive occasions. It has been stated that the practice of pledging, or saying 'I pledge you,' originated in England in the 10th c., it being then necessary for one to watch over the safety of his companion when the cup was at his lips. But the custom of drinking healths is of far higher antiquity, and was derived immediately from the boisterous convivialities of a Scandinavian and Teutonic ancestry (see VALHALLA), if not with equal likelihood from the usages of the early Britons, who were of Celtic origin. A story is told of a feast given by Hengist (5th c.) at his stronghold of Thong-caster, in Lincolnshire, to the British king Vortigern, and of the bewitchment of the royal guest by the charms of Rowena, the young and beautiful daughter of his entertainer. Rowena's address, as she gracefully knelt and presented the wine-cup to the king, *Liever kyning, wass heal,* or, 'Dear king, your health,' is often quoted as the origin of the still existing expressions wassail and wassail-cup; though wassail means pledging or health-drinking independently of the saying of Rowena, and certainly was not then uttered for the first time. Wassail is derived from the old Anglo-Saxon *Wæs hæl,* 'Be in health;' and *Wæs heil* and *Drinc heil* were the usual ancient phrases in quaffing among the English, and synonymous with 'Here is to you,' and 'I'll pledge you,' of later times. The explanation of wassail by an old writer, Robert de Brunne, may be appropriately quoted:

> 'This is ther custom and her gest
> When thei are at the ale or fest,
> Ilk man that levis qware him think
> Salle say *Wosseille,* and to him drink.
> He that biddis salle say, *Wassaile,*
> The tother salle say again, *Drinkaille.*
> That says Wosseille drinkis of the cop
> Kissand his felaw he gives it up.'

The learned Selden, in a note on the *Polyolbion*, says: 'I see a custom in some parts among us; I mean the yearly Was-haile in the country on the vigil of the new year, which I conjecture was a usual ceremony among the Saxons before Hengist, as a note of health-wishing (and so perhaps you might make it Wish-heil), which was expressed among other nations in that form of drinking to the health of their mistresses and friends. *Bene vos, bene nos, bene te, bene me, bene nostram etiam Stephanium*, in Plautus, and infinite other testimonies of that nature in him, Martial, Ovid, Horace, and such more agreeing nearly with the fashion now used; we calling it a health as they did also in direct terms.' For further particulars concerning wassail and wassail-bowl, see Brand's *Popular Antiquities*, edited by Ellis. It is enough here to quote from that authority the following passages: 'Milner on an ancient cup (*Archæolgia*, xi. 420), informs us that the introduction of Christianity among our ancestors did not at all contribute to the abolition of the practice of wasselling. On the contrary, it began to assume a kind of religious aspect, and the wassel-bowl itself, which in the great monasteries was placed on the abbot's table, at the upper end of the refectory or eating-hall, to be circulated among the community at discretion, received the honorable appellation of "Poculum charitatis." This, in our universities, is called the grace-cup. The poculum charitatis is well translated by the toast-master of most of the public companies of the city of London by the words, a "loving cup." After dinner, the master and wardens "drink to their visitors, in a loving cup, and bid them all heartily welcome." The cup [a silver flagon containing warm spiced wine] then circulates round the table, the person who pledges standing up while his neighbor drinks to him.'

While the drinking of healths is thus of old date, the application of the word 'toast' is modern, having had its origin in the practice of putting a piece of toasted bread in a jug of ale, hence called 'a toast and tankard.' The custom of so using the word is said to have had its rise at Bath, in the reign of Charles II. It happened that on a public day a celebrated beauty of those times was in the cross [or large public] bath, and one of the crowd of her admirers took a glass of the water in which the fair one stood, and drank her health to the company. There was in the place a gay fellow half-tipsy, who offered to jump in, and declared, though he liked not the liquor, he would have the toast. He was opposed in his resolution; yet this whim gave foundation to the present honor which is done to the lady we mention in our liquors, who has ever since been called a toast.—*Tatler*. Begun in the form of toasting beauties at private parties, toasts were in time given on all sorts of subjects at public festivities, accompanied with rounds of cheers and hurrahs, these noisy demonstrations being now called 'the honors.' The fatigue of announcing these exciting sentiments is so great, that in all well-ordered large assemblies a toast-master is employed.

Standing behind the chairman, this official, beside proclaiming the toasts, acts as a fugleman to regulate the clapping of hands and the 'hip, hip, hurrahs' of the company. 'Toasts, certainly, in this guise look more like a medium for taking an indefinite quantity of wine, than that spontaneous effusion of the heart in honor of some cherished individual, which they originally were. On certain occasions, these signals are hushed, and the convivial glass is taken "in solemn silence." The effect is certainly rather startling. A convivial glass to the memory of one departed has surely something in it of practical absurdity.'—Mrs. Stone's *Chronicles of Fashion* (1845). The absurdity of the whole toasting system has incurred the reprehension of temperance societies, without any perceptible abatement; but the old custom of drinking healths at private parties is now given up in good society, with the excesses which were formerly practiced.

As to drinking usages in connection with domestic events and social intercourse, there were, as is well known, drinkings on the occasions of births, baptisms, marriages, and even deaths; these last, which include the gloomy festivities of the *Lykwake*, or wake over the corpse of the deceased, being a relic of a very ancient custom, as was that, at least in Scotland, of drinking the *dredgy* (dirge) after the funeral solemnities were completed. In whatever manner these, as well as many other drinking usages, originated, it cannot be doubted that they were long maintained from the force of custom, with that demand for artificial stimulus provoked by the naturally phlegmatic character of a northern people. For the long nights of a cheerless climate, there seems to have been sought the solacement of those intoxicating agents, in which it would have been fatal to indulge under the sunny skies of the south. This is probably the philosophy of the subject, if there be any philosophy in it; and it cannot fail to be observed, that in proportion to an increase in the number of comfortable homes, the cultivation of mental resources, and the spread of a taste for harmless recreations, the more odious of the old convivialities disappear. Latterly, many amusing traditions respecting the drinking habits of a past age in Scotland, where they longest flourished without alteration, have been given in the *Memoirs of Lord Cockburn*, the *Autobiography of the Rev. Dr. Alexander Carlyle*, and the *Reminiscences of Scottish Life and Character*, by the Very Rev. Dean Ramsay (1860).

As regards miscellaneous drinking observances formerly common perhaps, the most offensive of all was that customary among tradesmen of imposing fines to be consumed in liquor. Apprentices, on being introduced to a workshop, paid so much entry-money to be spent in drink, and similar exactions were made from journeymen on entering a new employment. This was called paying their *footing*. When Benjamin Franklin, on his getting employment in a printing-office in London, refused to comply with this mischievous custom, he experienced,

as he tells us, a variety of petty annoyances. Among shipwrights, the penalty of non-payment was flogging with a hand-saw from time to time, and other mal-treatment. See Dunlop's *Drinking Usages of Great Britain* (1839) for many curious details of this kind. The abolition of these usages has kept pace with the increasing intelligence of the working-classes, and of such outrages little is now heard. Prisoners, on being lodged in jail, as related in the novels of Smollett and others, were obliged to pay *garnish* for drink to the brotherhood of which they had become members. This pitiless exaction is now totally gone, through the efficacy of modern prison-discipline.

The giving of *vails* [Lat. *vale*, farewell] to servants on quitting a gentleman's house, which became so intolerable in the 18th c., as at length to be given up by universal consent, meant, doubtless, a gift to be spent in drink to the health of the donor, and was analogous to the custom of giving a *trink-geld* in Germany, and a *pour boire* in France, to servants, drivers of carriages, and others. There were, at one time, numerous drinking usages connected with departures. We need only notice the *bonailie* [Fr. *bon allez*], or, as it is sometimes called, a *foy* [Fr. *voie*], a festive drinking at the away-going of servants or of persons in a still higher degree, once common in the Lowlands of Scotland; also the *stirrup-cup*, or, as it is called in the Highlands, *deoch an dorris*, or drink on getting on horseback, and being ready to set off. For the moral and physical evils connected with drinking usages, and the means taken to redress them, see TEMPERANCE: TOTAL ABSTINENCE.

DRIP, v. *drĭp* [AS. *drypan*, to drip: Icel. *driupa;* Dut. *druppen*, to fall in drops: Lith. *dripti*, to hang, to fall as snow: comp. Gael. *druaip*, lees, dregs]: to fall in drops; to let fall in drops; to have a liquid falling from it in drops, as a wet garment *drips*. N. that which falls in drops; the edge of a roof; the eaves; projecting edge of a molding, so channelled that the rain will drip from it instead of trickling down the wall. DRIP'PING, imp. DRIPPED or DRIPT, pp. *drĭpt*. DRIP-JOINT, n. in *plumbing*, a mode of uniting two sheets of metal in roofing where the joint is with the current, so as to form a water-conductor. DRIP'PING, n. the fat from meat while roasting. DRIPPING-PAN, a pan for receiving the fat from meat roasting. DRIPS, n. plu. steps made in flat roofs or gutters. DRIP-STONE, a projecting slab or molding to throw off the rain: placed over the head of a Gothic door-way or window; known also as a water-table or weather-molding. Though such was, no doubt, its primitive use, the drip-stone latterly became a mere ornamental appendage, which served to enrich and define the outline of the arch. It does not commonly extend lower than the springing of the arch, though this rule has exceptions. When the tracery extends to a lower level, the external drip-stone usually accompanies it. The drip-stone is not so constant a feature in continental as in English Gothic.

DRISLER, *drĭs'lẽr*, HENRY, LL.D.: b. Staten Island, N. Y., 1818, Dec. 27—1897, Nov. 30: educator. He graduated at Columbia College 1839, was classical instructor in its grammar school several years, and was appointed tutor of Greek and Latin in the college 1843, adjunct prof. in the same dept. 1845, prof. of Latin 1857, and prof. of Greek to succeed the late Charles Anthon, LL.D., 1867. He was associated with Dr. Anthon in the preparation of a standard series of classical text-books; edited and enlarged edition of Liddell and Scott's Passow's Greek Lexicon 1846, and was associate editor of the 7th revised Oxford edition 1883; edited an enlarged edition of Yonge's *English-Greek Lexicon* 1870.

DRIVE, v. *driv* [AS. *drifan;* Goth. *dreiban;* Ger. *treiben,* to urge forward, to move under the influence of an overpowering force: Icel. *dreifa,* to scatter]: to impel or urge forward by force; to compel; to guide or regulate, as the horses in a carriage; to pass from one place to another in a vehicle; to distress; to press; to be forced along; to rush or press with violence; to be moved by any force; to tend to; to aim at, in *cricket,* to hit the ball forward in front of mid-wicket; in *shoot.*, to force game from a covert toward the guns; in *min.*, to cut or dig horizontally; to make a drift in; *drive* is the reverse of *lead:* N. a ride or excursion in a carriage; the road passed over; in *forging,* a matrix formed by a steel punch, die, or drift; DRI'VING, imp. DROVE, pt. *drōv.* DRIVEN, pp. *drĭv'n.* DRIVER, n. *drī'vẽr,* one who, or that which. DRIVER, on *shipboard,* large sail, occasionally set upon the mizzen-mast with a yard or gaff A boom, called the *driver-boom,* extends the lower part of the sail some distance over the stern, like a cutter's mainsail. DRIVER, in *ship-building,* the foremost spur in the bulge ways, the heel of which is fayed to the fore-side of the foremost poppet, and the sides placed to look fore and aft in a ship; in *turning,* a bent piece of iron fixed in the center-chuck, and projecting so as to meet the carrier or dog on the mandrel to which the work is attached; in *weaving,* the piece of wood which impels the shuttle through the shed of the loom: DRIVE-BOLT, n. a drift; a bolt for setting other bolts home or depressing the heads below the general surface. DRIVEN WELL, n. well formed of a tube driven into the ground until its perforated end reaches a stratum containing water. DRIVER-ANT, n. in *entom.*, *Anomma arcens,* species of ant, so called from its driving before it almost any animal which comes in its way; native of w. Africa. DRIVER-BOOM. n. *naut.*, the boom to which the driver is hauled out. DRIVER-SPANKER, n. *naut.*, same as DRIVER. DRIVING-BOX, n., the journal-box of the axle of a driving-wheel. DRIVING-GEAR, n. that portion of a machine which is especially concerned in the motion; as the parts from the cylinder to the wheels, inclusive, of a locomotive; the ground wheel to the cutter-bar pitman, inclusive, of a harvester; the hand-crank and gearing of a winch or crab, etc. DRIVING-NOTES, n. in *mus.*, syncopated notes; notes driven through the ensuing accent.

DRIVING-SHAFT, n. a shaft communicating motion from the motor to the machinery. Shafting transmits power; but the driving-shaft is more immediate to the power; the motor. DRIVING-WHEEL, or DRIVER, the wheel in a machine which communicates motion. TO DRIVE A BARGAIN, to haggle about the terms. TO DRIVE A TRADE, to carry on a trade.

DRIVEL, n. *drĭv′l* [Gael. *dripel*, confused, indistinct: Icel. *drafl*, loose, idle talk: Sw. *drafwel*, nonsense: Low Ger. *draueln*, to speak in a childish, foolish manner]: slaver; saliva or spittle from the mouth: V. to let the saliva drop from the mouth; to slaver; to be weak or foolish. DRIV′ELLING, or DRIV′ELING, imp. *drĭv′lĭng*. DRIVELLED or DRIVELED, pp. *drĭv′ld*. DRIVELLER or DRIVELER, n. *drĭv′lėr*, a fool; a dotard.

DRIZZLE, v. *drĭz′l* [Ger. *rieseln;* Dan. *drasle*, to purl, as a brook, to fall in grains, as snow or small rain: Sw. *droseln*, to make a rattling or rustling noise in falling]: to rain in small drops of fine rain. DRIZZLING, imp. *drĭz′lĭng*. DRIZZLED, pp. *drĭz′ld*. DRIZZLY, a. *drĭz′lĭ*, shedding a fine or light rain.

DROBISCH, MORITZ WILHELM; b. 1802; d. 1896. A distinguished German professor of mathematics and philosophy in the University at Leipzig, in which city he was born and passed his life. His philosophical work is best known through his advocacy of the Herbartian psychology and philosophy.

DROG, or DROGUE, or DROUGUE, n. *drŏg* [perhaps from *drag*]: a buoy, or square piece of wood, attached to the end of a harpoon line to check the speed of the whale when running or sounding.

DROGER, or DROGHER, n. *drōg′ėr* [F. *droguer*, a boat for catching and drying herrings: Dut. *droog*, from *drogen*, *droogen*, to dry]: a W. India cargo boat, employed in coasting, having long, light masts and lateen sails.

DROGHEDA, *drŏh′ċhė-da* (F. 'bridge of the ford'): well-built parliamentary and municipal burgh and sea-port, in a county by itself of nine sq. m. on the borders of Meath and Louth; on both sides, but chiefly n. of the Boyne, 4 m. from its mouth, 31 m. n. of Dublin. The Dublin and Belfast railway crosses the Boyne here by a viaduct 95 ft. high. There are linen and cotton manufactures, tanning and brewing works, and an iron-foundry. It has considerable trade, chiefly with Liverpool, 140 m., principally in corn, meal, flour, cattle, provisions, linen, hides, and butter. Great quantities of ale are sent to the colonies. Vessels of 500 tons reach the quay, and barges of 50 tons ply 19 m. up the Boyne to Navan. Drogheda sends one member to parliament. The parts of Drogheda on the opposite sides of the river formed two opposing corporations till 1412, when a sermon by a monk induced them to get a charter of union from Henry I. From the 14th to the 17th c., Drogheda was the chief military station in Leinster. Many parliaments were held in Drogheda, and

it had the right to coin money. Poyning's laws were enacted here. The English parliamentary army twice besieged Drogheda, and were repulsed; but in 1649, Cromwell stormed it and put 2,000 of the garrison to the sword. In 1690, after the decisive battle of the Boyne, at Oldham, 2½ m. to the west, Drogheda surrendered to the forces of William III., upon the threat that if the town were taken by storm no quarter would be granted. One of the four ancient gates of Drogheda remains, and ruins of many monastic institutions are still seen. A handsome hall was recently presented to the town. Two newspapers are published here. Pop. (1901) 12,760.

DROGUE AMÈRE, *drŏg a-mĕr'* (Fr., bitter drug): celebrated stomachic bitter; of which the basis is creat root, and the other ingredients mastic, frankincense, myrrh, and aloes, all steeped for about a month in brandy, which is then strained and bottled.

DROHOBICZ, *drō'hō-bĭtch:* town of Austria, province of Galicia, on the Tyszmanika, a tributary of the Dniester; lat. 49° 25′ n., and long. 23° 30′ e. The town is in general ill built, but contains several interesting edifices, including a Basilian monastery, a castle, a high school, and two very handsome churches. Drohobicz has extensive salt works, which produce about 3,700 tons of salt yearly. There are in the vicinity iron mines and pitch-wells. Drohobicz has good trade in wine, linen, cotton, leather and grocery. It has corn and cattle markets. Seven-eighths of the people are Jews, who carry on most of the commerce of the town. Pop. 17,784.

DROIL, v. *droyl* [Icel. *driole*, a slave; *drjôli*, a sluggard]: in *OE.*, a sluggard; a drudge; V. to work sluggishly; to plod. DROIL'ING, imp. DROILED, pp. *droyld.*

DROIT D'AUBAINE, *drwâ do-bān':* peculiar right of the king of France, who by the old custom of the kingdom was entitled, on the death of a foreigner who had taken up his fixed residence there, to claim his movable estate, notwithstanding any testamentary settlement which he might have left. But when a foreigner went to France as a traveller, merchant, or foreign minister, without any intention of fixing his residence there, the droit d'aubaine was excluded. The Swiss, Savoyards, Scotch and Portuguese were exempted. This antiquated piece of injustice was abolished 1819.

DROITS OF THE ADMIRALTY: see ADMIRALTY DROITS.

DROITURAL, a. *droyt'u-ral* [F. *droiture*]: in *law*, pertaining or relating to a right to property, as distinguished from possession.

DROITWICH, *droyt'ĭtch:* parliamentary and municipal borough in Worcestershire, England, containing four parishes and three churches; seven miles n.n.e. of Worcester, in the narrow valley of the small river Salwarp, on the Bristol and Birmingham and West Midland rail-

way, and on a canal connected with the Severn which admits vessels of 60 tons. It has direct communication, also, by other canals, with Birmingham and London and the intermediate district. Its chief trade is salt, for which it has been famous from remote times, and which is esteemed the best in Europe. In the middle of the town, rising from a depth of 200 ft., through beds of new red-sandstone and gypsum, are the celebrated wyches, or brine-springs, yielding over 115,000 tons of salt a year, nearly half of which is exported. Droitwich sends one member to parliament. It was the Roman Salinæ. The remains of a Roman villa were found here, with tesselated pavements, etc. Pop., municipal borough 4,021, parliamentary 10,147.

DROITZSCHKA: see DROSKY.

DROLL, a. *drōl* [F. *drôle*, a wag, a comical fellow: Dut. *drollig*, burlesque, odd: Low Ger. *draueln*, to speak in a childish manner: Icel. *troll*, a hobgoblin: Gael. *droll*, an idler; *drol*, a trick]: out of the common way; odd; laughable; merry; comical: N. a comical fellow; a jester; one who raises mirth or laughter: V. to jest; to play the merry-Andrew; to cheat. DROL'LING, imp. DROLLED, pp. *drōld*. DROL'LERY, n. *-lĕr-ĭ*, sportive tricks; comical gestures or manners. DROL'LINGLY, ad. *-lĭ*. DROL'LISH, a. somewhat droll.—SYN. of 'droll, a.': comic; comical; ludicrous; ridiculous; farcical; diverting; arch; waggish; facetious; queer; amusing.

DROMAIUS, n. *drŏ-mā'ŭs* [Gr. *dromaios*, running at full speed, swift]: in *ornith.*, a genus of *Struthionidæ*. *Dromaius Novæ Hollandiæ* is the Emu of New Holland: see EMU.

DROME, *drōm:* dept. of France, on the e. bank of the Rhone, s. of the dept. of Isere; 2,500 sq. m. In the w. of the dept., running from n. to s. along the Rhone, stretches a sandy plain of from five to eight m. in breadth; but toward the e. the surface is hilly; a spur of the Alps traversing the e. boundary, and sending offshoots of about 3,500 ft. in average height westward across almost the entire area of Drome. These heights, whose sides are covered with forests of pine, oak, and beech, afford excellent pasturage in summer and autumn. The general direction of the rivers of Drome is w., toward the Rhone, and the most notable of them are the Drome, from which the dept. takes its name, and the Isere. Vines and mulberry, chestnut, walnut, and olive trees are extensively grown. About 8,600,000 gallons of wine are produced annually. Many of the vineyards are famous; probably the most celebrated is that of L'Hermitage, near Tain, on the banks of the Rhone, which yields red and white wines hardly surpassed in the world. Drome has several iron-mines, also copper, lead, and to some extent coal. The manufactures are chiefly woolen cloth, silk, hosiery, serge, and cotton yarn. The dept. is traversed by the Lyon and Avignon railway. It is divided into the four arrondisse-

ments of Valence, Montélimart, Die, Nyons, with the town of Valence for capital. Pop. (1900) 297,321.

DROMEDARY, n. *drŭm'ĕ-dĕr-ĭ* [F. *dromadaire*—from mid. L. *dromădarĭus*—from Gr. *drŏmas*, a running, swift]: name sometimes given, probably at first through mistake, to the Arabian or one-humped camel (*Camelus dromedarius*), but properly belonging to a variety of that species, distinguished by slenderness of limbs and symmetry of form, and by extraordinary fleetness. It has been well described as 'bearing much the same relation to the ordinary camel as a race-horse or hunter does to a cart-horse.' The pace of the dromedary is a trot, which it can maintain without intermission for a prodigious length of time; often at the rate of nine miles an hour for many hours together; while a journey of upward of 600 m. is performed at a somewhat slower rate in five days. Even its more rapid pace can be maintained for 24 hours at a stretch, without sign of weariness and without food; and if then it is allowed a little refreshment, of a ball of paste made of barley and powdered dates and a little water or camel's milk, it will resume its journey, and go on with undiminished speed for 24 hours more. The jolting to the rider is terrible. The gallop is a pace unsuitable to the dromedary, and at which it very soon fails. Dromedaries are sometimes trained to run races. White dromedaries are particularly prized in some parts of the East. See CAMEL.

DROMGOOLE, WILLIAM ALLEN (MISS), American author: b. Murfreesboro, Tenn., 1860, Oct. 26. She was for several years engrossing clerk in the State capitol at Nashville, and after teaching school in Tennessee and Texas for a few years, took up the literary work in which she has since been engaged. She has written: *The Heart of Old Hickory* (1895); *Valley Path* (1898); *The Farrier's Dog and His Fellow* (1899); *Three Little Crackers From Down in Dixie* (1898); *Rare Old Chums* (1898); *A Boy's Battle* (1898); *Cinch, and Other Tales of Tennessee* (1898); *The Moonshiner's Son* (1898); *Harum-Scarum Joe* (1889); *The Battle on Stone River* (1899).

DROMIA, n. *drō'mĭ-a* [Gr. *dromos*, running]: in *zool.*, the sponge-crabs, a genus of anomurous decapods. They are natives of warm seas. DROMIIDÆ, n. *drŏm-ī'ĭ-dē*, family of anamurous crustaceans, of which Dromia is the type.

DROMORE, *drō'mōr* (*Druim Mor*, Great Ridge): episcopal city in the n.w. of the county of Down, Ireland, on the Lagan; 14 m. s.w. of Belfast. It has linen manufactures. In the peat-bogs here were found the remains of an elk, the space between the extremities of whose horns measured 10 ft. 3 inches. North of Dromore is a mound or rath, 60 ft. high, with three concentric intrenchments, and great outworks toward the Lagan. The see of Dromore was founded by St. Colman in the 6th c., but is now united with those of Down and Connor. Jeremy Taylor, when bishop here, built the present church. Pop. (1900) 2,300.

DRONE, n. *drōn* [AS. *draen,* the non-working bee—from the buzzing sound it utters: Icel. *drunr,* a loud hollow noise: Sw. *dronare,* one that makes a droning noise—from *drona,* to drone: Gael. *dranndan,* humming, buzzing]: the male of the honey-bee which makes no honey (see BEE): an idler; a sluggard; a dull humming sound; the large pipe of the bag-pipe, which sends forth a continuous deep, unvaried sound: V. to emit a dull humming sound; to live idly. DRO'NING, imp. DRONED, pp. *drōnd.* DRO'NISH, a. *-nĭsh,* idle; lazy. DRO'NISHLY, ad. *-lĭ.* DRO'NISHNESS, n. DRONE-PIPE, n. the largest of the three pipes of a bag-pipe; any instrument which emits a droning sound.

DRONT'HEIM: see THRONDHJEM.

DROOP, v. *drôp* [Icel. *drúpa,* to droop; *dryp,* and *driupa,* to drip: comp. Gael. *drub,* an inclination to sleep]: to hang down; to lean forward or downward; to fail, sink, or decline; to languish from grief or other cause; to faint or grow weak. DROOP'ING, imp. DROOPED, pp. *drôpt.* DROOP'INGLY, ad. *-lĭ.* DROOPING-TULIP, n., in *bot.*, *Fritillaria meleagris,* from the flower hanging downward, and much resembling a tulip in form.

DROORAJAPATAM', or DOOGOORAUZEPATAM': town on the Coromandel coast of Hindustan, with remarkable facilities for navigation, both maritime and inland. It stands on an inlet, which connects Blackwood Harbor with Pulicat Lake, the former being the only safe haven on the w. side of the Bay of Bengal, and the latter being artificially continued as far as Madras. The place is 60 m. n. of Madras, and 34 s. of Nellore; lat. 13° 59′ n. and long. 80° 13′ east.

DROP, n. *drŏp* [Dut. *drop;* Sw. *droppe;* Ger. *tropfen;* Icel. *dropi,* a drop: Icel. *driupa,* to drip]: a small portion of a fluid; a very small quantity; a globule of a liquid; anything in the supposed form of a globule of water, as an ornament; part of a gallows on which the criminal stands: V. to pour or let fall a liquid in small portions; to let fall *anything;* to dismiss or lay aside, as to drop a subject; to utter slightly or briefly, as to drop a hint; to sink or lower; to fall; to come to an end; to have done with, as to drop an acquaintance; to visit unexpectedly, as to drop in. DROP'PING, imp.: N. a distilling; a falling; that which drops or falls. DROP'PINGS, n. plu. the excrement or dung of animals. DROPPED, pp. *drŏpt.* DROPPER, n. in *agri.*, one form of a reaping machine in which the grain falls upon a slotted platform, which is dropped occasionally to deposit the gavel upon the ground. Simultaneously with the bringing into action of the dropper, a cut-off is brought down to arrest the falling grain till the platform is reinstated; in *min.*, a divaricating vein, which leaves the main lode; or a lode which assumes a vertical direction.. DROP'LET, n. *-lĕt,* a little drop. DROP'PINGLY, ad. *-lĭ.* DROPS, n. plu. a medicine, the dose of which is measured by drops; certain flattened circular sweetmeats. DROP-BOX, n. in *weav.*, a shuttle-box used in figure weaving looms in which each shuttle carries its own color. DROP-FLUE BOILER, a

boiler in which the caloric current descends by one or more steps or gradations, bringing it into contact with parts of the boiler in descending series; the object being to cause it to leave the boiler at the lower part, where the feed-water is introduced. DROP-HAMMER, n. a hammer in which the weight is raised by a strap or similar device, and then released so as to drop upon the object below, which rests upon the anvil. It is used in swaging, die-work, striking up sheet-metal, jewelry, etc. DROP-KICK, n. in *foot-ball*, a mode of kicking the ball by letting it fall from the hands and kicking it as it begins to rebound from the ground. DROP-METER, n. an instrument for measuring out liquid drop by drop. Sometimes called a dropping-bottle, dropping tube, burette, pipette. DROP-PRESS: same as DROP-HAMMER (q.v.). DROP-ROLLER, n. in *print.*, a roller dropping at intervals to draw in a sheet of paper to the press. DROP-SEED, n. in *bot.*, a plant, *Muhlenbergia diffusa*, or American grass. DROP-TABLE, n. a machine for lowering or raising weights, as in the hatchways and cellar-ways of city warehouses; a machine for withdrawing carriage and locomotive wheels from their axles. To DROP ASTERN, in *sailors' language*, to slacken the speed of a vessel to allow another to pass her. To DROP DOWN, to sail or move down a river. DROP-SCENE, in a *theatre*, a painted curtain suspended by pulleys, which is made to fall at the front of the stage between the scenes or acts.—SYN. of drop, v.': to sink; tumble; distil; cease; discontinue; suggest; lower; send; variegate; speckle; die.

DROPPERS, GARRETT: American educator; b. Milwaukee, Wis., 1860, April 12. He was graduated at Harvard 1887, and later studied at the University of Berlin 1888-9. From 1889 to 1898 he was professor of political economy and finance in the University of Tokio, Japan. He was secretary of the Asiatic Society of Japan and contributed to its 'Transactions' several important and valuable articles on Japanese currency questions. Since 1898 he has been president of the University of South Dakota at Vermilion, S. D. He has published a 'Translation of Schopenhauer's Essays' (1881).

DROPSY, n. *drŏp-sĭ* [OF. *hydropisie*, the dropsy: L *hydropĭsis;* Gr. *hudrōps*, the dropsy—from Gr. *hudōr*, water—the word having been formerly written *hydropisy*]: unnatural collection of water or lymph in any part of the body. DROP'SICAL, a. *-sĭ-kăl*, inclined to dropsy. DROPSICALNESS, n. the quality or state of being dropsical. DROP'SIED, a. *-sĭd*, having dropsy. Dropsy belongs to a class of affections always of serious import, though not often directly fatal. It is indeed rather a symptom than a disease; it consists of the effusion of watery fluid from the blood into the skin and the subjacent tissues, or into the cavities of the body. When the effusion is chiefly in the superficial parts, the dropsy is called anasarca [*ana*, upon; *sarx*, the flesh]; or edema if it is slight in extent; when in the abdomen, it is termed ascites; when in the pleural cavity, hydrothorax; when in the pericardial sac, hydro-

pericardium; when within the cranium, hydrocephalus. Dropsy most usually depends on disease of the heart (q.v.) or kidneys (q.v.); in cases of ascites, the liver and spleen are often at fault. The treatment of dropsy is chiefly by diuretics (q.v.), sudorifics and cathartics, which remove the fluid from the tissues by unloading the blood of its excess of serum. In all cases of dropsy, the internal organs should be, if possible, submitted to a strict medical examination, and the treatment regulated accordingly. DROPSY, in *bot.*, a disease in plants caused by an excess of water.

DROSERA, n. plu. *drŏs'ĕr-ă* [Gr. *dorsĕros*, dewy—from *drosos*, dew]: genus of herbaceous plants, ord. *Droserācĕæ*. DROSERA'CEÆ, nat. ord. of exogenous plants, consisting entirely of herbaceous plants, which generally inhabit marshy places, and are often covered with glands. All the leaves are frequently radical, and they and the flower-stalks are rolled up in bud like the fronds of ferns. There are five sepals, five petals, five, ten, fifteen, or twenty stamens; the fruit is a one-celled capsule, with numerous seeds. About 100 species are known, distributed over most parts of the world, many of them plants of very delicate appearance; and many of them, as the species of *Drosera* or SUNDEW, natives of Britain, are remarkable for their glandular hairs, which secrete a viscid fluid, and by means of it often fatally detain flies which alight on them—the leaves folding together over the insects. *Rosidula dentatā* is placed in houses in s. Africa on this account. Venus's Fly Trap belongs to this order. See DIONÆA. Acrid and stimulant properties prevail in the Droseraceæ.

DROSKY, and DROSCHKY, n. *drŏs'kĭ* [Russ. *drozhki*]: a four-wheeled open carriage used by the Russians—many kinds of vehicles are now so called. DROS'KIES, n. plu. *-kĭz*.

DROSOMETER, n. *drŏs-ŏm'ĕ-tĕr* [Gr. *drosos*, dew; *metron*, a measure]: apparatus or instrument for determining the amount of dew deposited during a single night; it is merely a balance delicately poised, one scale open to the dew, the other protected from it; and the amount of dew on the wet scale is indicated by weights placed on the other.

DROSS, n. *drŏs* [AS. *dros;* Dut. *droes*, dregs, filth: OF. *drasche*, lees; *dresche*, crushed barley]: worthless matter separated from the better part; any waste or refuse; the scum or refuse of metals thrown off in melting; impurity; small broken coals. DROS'SY, a. *-sĭ*, full of dross; impure; foul. DROS'SINESS, n. *-nĕs*, foulness; impurity.—SYN. of 'dross': scum; impurities; lees; dregs; excrement; incrustation; rust; waste; refuse.

DROSTE-HÜLSHOFF, *dros'tĕh hüls'hof*, ANNETTE ELIZABETH: 1798, Jan. 12—1848, May 24; b. on the estate of Hülshoff, near Münster: German lyric poetess. Of delicate constitution, and living in complete seclusion from the world, she nevertheless received an excellent scientific education. In 1825 she was introduced into a wider circle of

distinguished men and women at Cologne and Bonn, but in a short time retired again to her maternal estate of Rischhaus, near Münster, where she lived almost exclusively for science, nature, and poetry. She died near Lake Constance. Though distinguished among literary women of the time, she retained all the timidity of her sex, avoiding the eccentricities of many women who think they have a mission to regenerate society. Her *Gedichte* (Poems) appeared at Stuttgart 1844, and of her posthumus works *Das geistliche Jahr nebst einem Anhang religiöser Gedichte* at Stuttgart 1852. The poems are not only perfect as regards form, but also show a remarkable union of womanly gentleness and poetical creative power.

DROUET, *drô-ā′*, Jean Baptiste, Comte d'Erlon: French Marshal: 1765, July 25—1844, Jan. 25; b. Rheims. he entered a regt. of volunteers 1792, and took part 1793-96 in the campaigns of the Moselle, Meuse, and Sambre. His important service quickly obtained him promotion. His conduct in the peninsular war was highly distinguished, and elicited the warmest eulogiums from Massena. After the fall of Napoleon, the Bourbons tried to secure his services and gave him the command of the 16th division, but he was shortly afterward arrested on the charge of conspiring against the royal family. Managing to escape, he remained in concealment in Lille until the return of Napoleon from Elba, when, putting himself at the head of the troops he seized the citadel and held it for the emperor, who made him a peer of France. At the battle of Waterloo he commanded the first *corps d'armée*. After the capitulation of Paris, he fled to Bavaria, where he resided until the July revolution, when he returned to France, and received, 1832, the command of the army of Vendée. During 1834–5, he held the important office of gov. gen. of Algeria, and in 1843 was elevated to the rank of marshal.

DROUGHT, n. *drowt* [AS. *druguth;* Dut. *drooghte;* Scot. *drouth*—from AS. *dryg;* Dut. *droogh*, dry]: dry weather; want of rain; thirst. Droughty, a. *drow′tĭ*, wanting rain; thirsty. Drough′tiness, n. *-nĕs*, state of dryness of the weather. Drouth, n. *drowth*, dry weather; thirst; another spelling of Drought. Drou′thy, a. *-thĭ*, thirsty. Drou′thiness, n.

DROUYN DE LHUYS, *drô-ăng′ dĕh lwē′*, Edouard: 1805, Nov. 19—1881, Mar. 1; b. Paris: French diplomatist and politician. He studied at the college of Louis-le-Grand and the École de Droit. He was at first attached to the embassy at Madrid, whither he went 1830. In 1840 he was placed at the head of the commercial dept. under the minister of foreign affairs, and shortly afterward was elected *député* for Melun; but taking a part hostile to the government, of which he was a subordinate member, he was deprived of his situation by Guizot. This gave him fuller scope for the advocacy of his political opinions. He now became an active member of the *Reforme* party, and after the famous banquet of the 12th arrondissement had

been interdicted, he signed with the other chiefs of the opposition, the accusation drawn up against Guizot and his colleagues. Elected representative of the people to the constituent and legislative assemblies, by the dept. of Seine-et-Marne, he was made first a member and then pres. of the committee of foreign affairs. Here he acted generally with the moderate party. In the first cabinet formed by Louis Napoleon after his election to the presidency, 1848, Dec., Drouyn de Lhuys became minister of foreign affairs, and directed the French policy in all the difficult European complications of the year. In 1849 he went to London for a short time as ambassador, and after the *coup d'état* became one of the vice-presidents of the imperial senate, and again minister of foreign affairs. Being disappointed at the issue of the Vienna Conferences in 1855, he resigned his office. In 1863 he was recalled to his old post, resigning again 1866. In 1871, he fled to Jersey.

DROVE, n. *drōv* [from *drive:* AS. *drifan*, to urge forward]: a number of animals, as sheep or cattle, moving in a body; a crowd of people in motion; in *agri.*, a narrow channel or drain used for the irrigation of land; in *masonry*, a broad-edged chisel used by stone-masons; a mode of parallel tooling by perpendicular fluting on the face of hard stones. DROVED, a. in *masonry*, tooled. DROVER, n. *drō'vėr*, one who drives cattle and sheep to market. DROVING, n. in *masonry*, the same as tooling. DROVED ASHLAR, in *masonry*, chiselled or random-tooled ashlar, an inferior kind of hewn work used in building. DROVED AND BROACHED, in *masonry*, a term applied to work that has been first rough-hewn and then tooled clean.

DROWN, v. *drown* [Icel. *dreckia*, to sink under water: Dan. *drukne*, to drown (see DRINK)]: to overwhelm in water; to destroy life by submersion in water; to immerse; to overflow; to inundate; to perish in water; to put an end to, as to drown care. DROWN'ING, imp.: ADJ. perishing in water (see ASPHYXIA): N. the act of destroying life by immersion in water. DROWNED, pp. *drownd.—Drowning*, as a mode of capital punishment, has only recently ceased in Europe, and is probably still in use in some other quarters of the world. Tacitus, about the end of the 1st c., tells us that the Germans hanged their criminals of higher grade, but that meaner and more infamous offenders were plunged under hurdles into bogs and fens. By the law of the ancient Burgundians, a faithless wife was to be smothered in mud. The Anglo-Saxon codes ordered women convicted of theft to be drowned. The punishment was in such common use throughout the middle ages, that grants of capital jurisdiction ran *cum fossa et furca*, i. e., 'with pit and gallows.' The pit, ditch, or well, was for drowning women; but the punishment was inflicted occasionally on men. The doom of the parricide was to be put into a sack and cast into the sea. John of Nepomuk (q.v.,) afterward enrolled in the catalogue of saints, was drowned 1393, for refusing to reveal the secrets of the confessional.

In this instance, perhaps, drowning was a mode allowed to the offender as a matter of favor. So in Scotland, 1556, a man convicted of theft and sacrilege, was sentenced to be drowned, 'by the queen's special grace.' So lately as 1611, a man was drowned at Edinburgh for stealing a lamb. By that time, the punishment of drowning had become obsolete in England. It survived in Scotland until 1685. The last execution by drowning in Switzerland was in 1652, in Austria in 1776, in Iceland in 1777. DROWNED-LEVEL, n. in *min.*, a depressed level or drainage gallery in a mine, which acts on the principle of an inverted siphon; a blind-level. DROWNING-BRIDGE, n. a sluice-gate for overflowing meadows.

DROWN, THOMAS MESSINGER, M.D., LL.D.: educator: b. in Philadelphia, Pa., 1842, Mar. 19; d. Bethlehem, Pa., 1904, Nov. 16. He graduated at the Philadelphia High School, and later (1862) at the Univ. of Penn. with the degree M.D. He took graduate studies in chemistry at Yale and Harvard, afterward in Europe, at Freiburg, Heidelberg, and Paris, till 1868. He practiced as analytical chemist in Philadelphia; became prof. of analytic chemistry in Lafayette College 1874, and in Mass. Institute of Technology 1881. In 1895, he was made LL.D. of Columbia College, and became pres. of Lehigh Univ., Penn.

DROWSE, or DROWZE, *drowz:* see under DROWSY.

DROWSY, a. *drow′zĭ* [Dut. *droosen*, to doze, to slumber: Dan. *drose*, to dawdle: Low Ger. *drusseln*, and *drësseken*, to slumber]: inclined to sleep: sleepy; dull; sluggish. DROW′SINESS, n. *-nĕs*, heaviness or disposition to sleep. DROW′SILY, ad. *-lĭ*. DROW′SY-HEADED, having a sluggish disposition. DROWSE, v. *drowz*, to slumber; to grow heavy with sleep. DROWSE, or DROWZE, n. heavy sleep; slumber. DROW′SING, imp. DROWSED, pp. *drowzd:* ADJ. looking heavy or sleepy.—SYN. of 'drowsy': heavy; dozing; lethargic; comatose; stupid.

DRUB, v. *drŭb* [Icel. *drepa*, to strike: Sw. *drabba*, to hit or knock]: to thrash; to beat with a stick; to beat soundly. DRUB′BING, imp.: N. a sound beating. DRUBBED, pp. *drŭbd*.

DRUDGE, v. *drŭj* [AS. *dreogan*, to work: Gael. *dreuchd*, to labor in low offices: Ir. *drugaire*, a slave or drudge]: to work hard; to labor in mean offices: N. one who labors with toil and fatigue; one employed in mean labor. DRUDG′-ING, imp. DRUDGED, pp. *drŭjd*. DRUDG′ER, n. a laborer in menial or mean offices; a slave; a drudge. DRUDG′ERY, n. *-ĕr-ĭ*, hard and continuous labor; ignoble toil. DRUDG′-INGLY, ad. *-lĭ*.

DRUG, n. *drŭg* [F. *drogue*, a drug: Dut. *droog* and *droogh*, dry, from their hot dry nature as once used: It. *treggea;* Sp. *dragea*, sweetmeats—articles of that nature having formerly constituted the principal stock of a druggist]: any medicinal substance, or material agent used in the treatment of disease, when in crude or commercial form; any article slow of sale, or not saleable: V. to dose

to excess with medicine; to season or tincture with something offensive or injurious. DRUG'GING, imp. dosing with drugs. DRUGGED, pp. *drŭgd.* DRUG'GIST, n. *-gĭst,* one who deals in drugs: see APOTHECARIES: CHEMISTS AND DRUGGISTS: PRESCRIPTION.

DRUG ERUPTIONS: Certain drugs used in medicine have the inconvenience, when administered through long periods or in the case of certain individuals having a peculiar idiosyncrasy in this respect, of causing more or less troublesome and disagreeable eruptions on the skin. These eruptions may be due to direct irritation by the drug, as when the latter is applied externally, or to its more remote toxic effect when it is taken internally only. Even in the latter case, however, the eruption may be due more or less to local action if the drug is excreted in whole or in part by the skin. Certain substances almost always excite an eruption, that being classed among their normal physiological actions. Such as arsenic, belladonna, copaiba, iodide of potassium and other salts of iodine, the bromides, and nitrate of silver. The eruption due to the action of arsenic is usually of an irritative character, accompanied by itching of the skin; the appearance of the eruption varies: it may be a simple erythema suggesting erysipelas, or a popular eruption, or one with wheals like urticaria, or with vesicules or watery blebs which later become pustular, or there may be a general horny thickening of the skin, especially of the hands or feet. The belladonna eruption often closely resembles that of scarlet fever, but is to be distinguished from that by the absence of fever and other symptoms of systemic involvement and by the fact that belladonna has been given. Occasionally such a generally blush has been observed to follow the dropping of atropine (an alkaloid of belladonna) into the eye in order to dilate the pupil. The bromides and iodides almost invariably cause an acne-like eruption when administered over long periods of time. The use of balsam of copaiba not infrequently causes a rose-colored, irregularly distributed rash, resembling that of measles or of German measles (rötheln). Nitrate of silver, when used continuously for a long time, causes a bluish or slaty discoloration of the skin; this is, however, not an eruption strictly speaking, but a deposit of particles of silver in the deeper layers of the corium; the same deposit occurs under the conjunction and in the tissues of the organs.

Other drugs may produce an eruption in susceptible persons or in those who have a special idiosyncrasy. Antipyrine and acetanilide (the latter the active ingredient in most 'headache cures') sometimes causes a rash like that of measles, and sometimes after long-continued use the skin presents a bluish (cyanotic) appearance due to deficient exaggeration of the blood. A red or rose-colored rash sometimes follows the absorption of boric acid when solutions of this drug have been used in large quantities to wash out the cavity of the chest or extensive abscesses after evacuation of the pus and scraping away of their

limiting membranes. Chloral sometimes induces a diffuse red eruption, especially when it is given in combination with alcohol. Morphine may produce a scarlatiniform rash accompanied by itching and irritation of the skin. Eruptions of various kinds—erythema, papules, pustules, wheals, or even gangrene—have been occasionally noted after the administration of quinine, and salicylic acid and its salts may also produce an erythematous such accompanied often with swelling of the lips and eyelids.

Finally the use of antitoxin in the treatment of diphtheria is very frequently followed by a bright rose-colored rash, sometimes smooth, sometimes accompanied with papules; less frequently there is an eruption of wheals like those of hives or urtiaria. In addition to the rash there may be swelling of the feet and ankles and rheumatic pains in the joints; fever is not common, but there may be an elevation of temperature even up to 102° or 103°. The rash may appear soon after the injection of the antitoxin, or its outbreak may be delayed as long as two or three weeks.

These drug eruptions do not ordinarily require any treatment, for they disappear quite promptly, as a rule, upon the discontinuance of the drug. They are important chiefly because of the danger that they may be mistaken for the rash of some disease, and may cause much mental distress to the sufferer until their true nature is discovered.

DRUID, n. *drôʹĭd* [Gael. *drud*, an inclosure; *druid*, to inclose, to surround; *druidh*, one admitted within the inclosure, a priest, a sorcerer, a druid: W. *derwydd*, a druid: L. *druĭdēs*, the priests and wise men of the Britons and Gauls]: one of the ministers or priests among the anc. Celts, Gauls, or Britons, who are said to have esteemed the oak sacred, and sacrificed under it. Dru'idism, n. *-izm*, the doctrines, rites, etc., of the Druids. Druid'ical, a. *-ĭ-kăl*, pertaining to the Druids. Dru'idess, n. a female Druid. Druid stones, a name given in the s. of England, and other parts of the country, to those weather-worn, rough pillars of gray sandstone which are scattered over the surface of the chalk downs in England, in Scotland, and its islands, and which exist in great numbers in other countries, generally in the form of circles, or in detached pillars: it is not certain, however, that the Druids had any connection with these stones.—*Druidism* is commonly spoken of as the religious system of the Gauls and Britons or of the Celtic peoples. Prof. Rhys, however, in his work on Celtic Britain (1882), affirms that the real religion of the Celts was an Aryan Polytheism like that of the Italians and Greeks; and that Druidism, so far as found among the Celts of Gaul or Britain, was by them derived from pre-Celtic and non-Aryan aborigines (Ivernians, Iberians, Euskarians, Neo-lithic men?), and was thus non-Aryan in origin. There is no reason, Rhys says, for holding that Druidism was found among the Brythonic or Kymric races proper, though it was in force among the originally Goidelic (Gaelic) people of Wales. Cæsar thus describes

the character and functions of the Druids: 'They attend to divine worship, perform public and private sacrifices, and expound matters of religion. A great number of youths are gathered round them for the sake of education, and they enjoy the highest honor in that nation; for nearly all public and private quarrels come under their jurisdiction; and when any crime has been committed, when a murder has been perpetrated, when a controversy arises about a legacy or about landmarks, they are the judges too. They fix rewards and punishments; and should anyone, whether a private individual or a public man, disobey their decrees, then they exclude him from the sacrifices. This is with them the severest punishment. The persons who are thus laid under interdict are regarded as impious and wicked people; everybody recoils from them, and shuns their society and conversation, lest he should be injured by associating with them. They cannot obtain legal redress when they ask for it, nor are they admitted to any honorable office. All these Druids have one chief, who enjoys the highest authority among them. When he dies, he is succeeded by the member of the order who is most prominent among the others, if there be any such single individual; if, however, there are several men equally distinguished, the successor is elected by the Druids. Sometimes they even go to war about this supremacy. At a certain time of the year, the Druids assemble on the territory of the Carnutes, which is believed to be the centre of all Gaul, in a sacred place. To that spot are gathered from everywhere all persons that have quarrels, and they abide by their judgments and decrees. It is believed that this institution was invented in Britannia, and thence transplanted into Gaul. Even now-a-days, those who wish to become more intimately acquainted with the institution generally go to Britannia for instruction's sake.

'The Druids take no part in warfare; nor do they pay taxes like the rest of the people; they are exempt from military service, and from all public burdens. Attracted by such rewards, many come to be instructed by their own choice, while others are sent by their parents. They are reported to learn in the school a great number of verses, so that some remain there twenty years. They think it an unhallowed thing to commit their lore to writing, though in the other public and private affairs of life they frequently make use of the Greek alphabet. . . . Beyond all things, they are desirous to inspire a belief that men's souls do not perish, but transmigrate after death from one individual to another; and they hold that people are thereby most strongly urged to bravery, as the fear of death is thus destroyed. Besides, they hold a great many discourses about the stars and their motion, about the size of the world and of various countries, about the nature of things, about the power and might of the immortal gods; and they instruct the youths in these subjects.'

It is easy to comprehend that this powerful priesthood did all that they could to uphold the national cause against

the Roman conquerors, and urged the people to resistance; so much so, that the Emperor Claudius found it necessary to interdict formally the practicing of Druidical rites, which seem, however, to have continued till the extinction of paganism. Besides being priests and teachers of religion, the Druids appear to have been also adepts in the magic arts, and were versed in the mysterious powers of animals and plants. The oak-tree is usually believed to have been especially sacred among the Druids. In oak-groves, they frequently performed their rites, and it has been supposed that they even derived their name from this custom. See CELTIC NATIONS. The Druids seem, however, to have performed their rites under any kind of trees; and some recent investigators deny the long-asserted origin of the name Druid from Gr. *drus*, an oak-tree. The Druids had a special reverence for the mistletoe, when growing on an oak. According to Pliny, a Druid, clothed in white, mounted the tree, and with a knife of gold, cut the mistletoe, which was received by another, standing on the ground, in his white robe. The same author gives a curious account of the 'serpent's egg,' worn as a distinguishing badge by the Druids. It was formed, he says, by the poisonous spittle of a great many serpents twined together. Gathered at moonlight, and afterward worn in the bosom, it was a mighty talisman. All these particulars refer properly to the Druids of Gaul, but Cæsar's testimony leaves no doubt that the Druidism of Britain was essentially the same.

In all the countries anciently inhabited by Celts, there are found rude structures of stone, one of the most common forms of which is the so-called *dolmen* (see DOLMEN). The older archæologists assumed that these were Druidical altars, but there is no proof that such was their destination or origin; similar structures are found in Scandinavia and many parts of Germany, and to assume in all these countries the presence of Celts, seems extreme. The same doubts prevail as to the larger monuments of this kind—the supposed Druidical temples of Amesbury, of Carnac in Brittany, and of Stonehenge (q.v.).

DRUIDS, ORDER OF: secret societies that have sprung from a club organized in London 1781, solely for the entertainment of its members. The popularity of the club soon led to the formation of others, and in time they were constituted a distinct order and provided with a ritual for initiations and a form of govt. founded upon traditions said to have been preserved from the ancient Druids. With the extension of the order many benevolent features were instituted. Differences of opinion among prominent members resulted in the division of the original order into several independent bodies. These are now reduced to two, the *Ancient Order of Druids* and the *Order of Druids of England*, to which all the 'groves' in Great Britain are subordinate. A 'grove,' chartered by the latter supreme body, was instituted in New York 1833, and was the parent of the order in the United States. The order rapidly extended through the country, and from the past officers a supreme body was

organized under the title of the *Grand Grove of the United States of the United Ancient Order of the Druids*, which declared its independence of the English supreme grove, made an entire change in the ritual, and introduced a number of new degrees. As now constituted the order in its benevolent features resembles *American Odd Fellowship* and some of the later orders, such as the *American Legion of Honor*, *Knights of Honor*, *Order of Chosen Friends*, and *Royal Arcanum*, that were founded expressly to conduct a life insurance business. In 1906 the order in the United States reported 24,000 members and $5,500,000 expended in benevolence since 1847.

DRUM, n. *drŭm* [imitative of the sound: Icel. *thruma*, thunder: Dan. *drum*, a booming sound: Dut. *trom*, a drum; Ger. *trommel;* Fr. *tambour*—modification of *tabour; timbrel* and *tambourine* are other forms of the word *tabour* or *tambour*]: a musical instrument, hollow, cylindrical, and flat at the two ends, one or both of which are covered with parchment or vellum, on which the drummer beats with an instrument of wood or metal called a drumstick; in a *machine*, a short cylinder moving on an axis, on which are the straps which move the several wheels; anything resembling a drum in form; in *arch.*, the bell-formed part of the Corinthian and Composite capitals; in *com.*, a small cylindrical box for holding fruit; a keg with straight sides; in *paper-making*, a washing-drum for cleansing rags; in *calico-print.*, one name of the cask in which steam is applied to printed fabrics in order to fix the colors: V. to beat or play on a drum. DRUM'MING, imp. DRUMMED, pp. *drŭmd.* DRUM'MER, n. one who; in the U. S. army every infantry company has one drummer and one fifer. The drummer is slightly superior in position to the privates, yet ranks as one of them. Besides his ordinary duties at drills and parade (see BEAT OF DRUM) he attends to the wounded on the battle-field. Drummers are often young, hardly more than boys. All the drummers and fifers of a regt. form the *Drum-corps.* DRUMMER in the *United States*, one who solicits custom, a traveling salesman. DRUM OF THE EAR, the tympanum or internal membrane of the ear which conveys the impression of sound. DRUM-HEAD, the parchment or skin stretched over each end of a drum; *naut.*, the head of the capstan, having square holes to receive the bars. DRUM-HEAD COURT-MARTIAL, a summary court summoned in haste around the big drum to try offenses committed in the field. DRUM-MAJOR, first or chief drummer in a regiment; little known in the English army till the time of Charles I., though there was in earlier times an officer in the royal household called the *drum-major-general.* In the U. S. army the drum-major is leader of the regimental drum-corps, instructing them, transmitting to them the orders for signals, and directing them on parade. His rank is sergeant, and he is attached to the non-commissioned staff. DRUM-SAW, n. a cylindrical saw for sawing curved stuff, staves especially; a cylinder-saw; a barrel-saw. DRUMSTICK, n. a stick with which a drum

is beaten, or anything resembling it. DRUM-WHEEL, n. a very ancient oriental form of water-raising wheel which was originally drum-shaped, but afterward had scoop-shaped buckets, which dipped up water and conducted it toward the axis, at or near which it was discharged. TO DRUM OUT, to expel ignominiously from the army (see DISCHARGE). TO DRUM UP, to assemble, as by beat of drum.—The drum as an instrument of music is used with other instruments in bands, particularly for military purposes. The military drum serves for giving various signals as well as for music. There are three kinds of drum—the *side* drum, the big or *base* drum, and the *kettle* drum. The last is the cavalry drum, a copper or brass hemisphere, resembling a *kettle*, with a parchment lid. The big or base drum has both ends covered with parchment. The smaller or side drum is called sometimes a *snare-drum*, having cat-gut strings stretched tightly across its lower head to add to the resonance. The SACRED DRUM was an object of religious veneration and an instrument of magical incantation among the Laplanders in former times. It was hollowed out of a piece of the trunk of a pine or birch, in which certain peculiarities were required, and was covered with skin on the upper side only, the wood being partly left on the under side to serve as a handle. Figures were painted in red on the skin; the drumstick was a reindeer's horn; and to the drum were appended a large copper ring and some smaller rings. The drum was considered a necessary part of the furniture of every family. The motions of the rings, when the drum was beaten, which might be done only by the head of the family, were supposed to afford indications concerning the results of disease and other future events. The beating of the drum was accompanied with songs, and the person by whom it was beaten often fell into a trance, during which revelations were supposed to be made to him. The sacred drum seems to have been in some way connected with the worship of the sun. The ancient Romans used small hand-drums—some resembling tambourines, others kettle-drums—in their religious dances; and the Parthians are said to have used them in war to give signals. They are believed to have been first brought into w. Europe by the Crusaders. TOM (or JOHN) DRUM'S ENTERTAINMENT, a proverbial expression for ill-treatment, probably alluding originally to some particular anecdote. The allusions seem to point to the dismissing of some unwelcome guest, with more or less ignominy and insult.

DRUM or SIEMENS ARMATURE: see ELECTRICAL MACHINES.

DRUM (*druim*): Celtic word meaning the back, and applied to a ridge of hills; it enters into the composition of many names of places, especially in Ireland, as Drumcondra, Drumglass, Drumsheugh.

DRUM: colloquial term for a fashionable and crowded evening-party about the middle of the 18th c., at which

card-playing appears to have been the chief attraction. The names drum, rout, and hurricane, by which these gay assemblies were known, sufficiently indicate their noisy, promiscuous character. Lady Mary Wortley Montagu, writing from Louvère to her daughter in 1753, hints that ladies gave these entertainments to make money at cards to support their extravagance; and adds: 'I find I should be as solitary in London as I am here, it being impossible to live in a *drum*, which, I think, so far from a cure of uneasiness, that it is, in my opinion, adding one more to the heap.' See ROUT.

DRUM, *drŭm*, RICHARD COULTER, U. S. A.: b. Westmoreland co., Penn., 1825, May 28: ad-gen. He was educated at the co. acad. and at Jefferson College; enlisted as a private in co. K, 1st Penn. vols., 1846, Dec. 8, served with his regt. in the Mexican war, and was engaged in the siege of Vera Cruz; was appointed 2d. lieut. U. S. inf. 1847, Feb. 18, assigned to the 9th inf. Apr. 9, joined his regt. May 19, and served with it till 1848, July, taking part in the battles of Contreras, Churubusco, Molino del Rey, Chapultepec, and Garita de Belen; was brevetted 1st lieut. for gallant conduct at Chapultepec 1847, Sept. 13; transferred to the 4th artil. 1848, Mar. 8, and promoted 1st lieut. 1850, Sept. 16. He then served in the south and west; and was appointed aide-de-camp to Gen. P. F. Smith, commanding dept. of the west, 1858, May. After serving as adj. of the artil. school at Fortress Monroe, he was appointed brev.capt. and assist.adj.gen. 1861, Mar. 16; promoted maj. and assist.adj.gen. 1861, Aug. 3; lieut.col. 1862, July 17, and col. 1869, Feb. 22; was assist. ad.gen. at the headquarters of the dept. of the Pacific, San Francisco, 1861, May—1866, Oct. 1; and in the same capacity at the headquarters of various depts. and divisions till 1878, May, when he was assigned to duty in the adj.gen.'s office, Washington. He was appointed brig.gen. and adj.-gen. of the army 1880, June 15, and was retired 1889, May 28.

DRUMBLE, v. *drŭm'bl* [Gael. *trom*, heavy, dejected; *trom-liche*, a weight on the heart or spirits]: in *OE.*, to make muddy; to be sluggish; to be heavy; to go about the doing of a thing in a confused, heavy manner. DRUMBLING, imp. *drŭm'blĭng*. DRUMBLED, pp. *drŭm'bld*. DRUMLY, a. *drŭm'lĭ*, or DRUMBLY, a. *drŭm'blĭ*, in *Scot.*, foul; muddy, as water; troubled.

DRUM-FISH: see POGONIAL.

DRUM'GOOLE, JOHN CHRISTOPHER, American clergyman: b. Longford co., Ireland, 1828; d. New York, 1888, March 28. He was ordained a Roman Catholic priest in the United States, and in 1871 began an organized mission in New York for homeless boys. The work grew under his charge and he built in New York a home called the 'Mission of the Immaculate Virgin,' and established an industrial farm of over 600 acres on Long Island, all in the interest of homeless boys.

DRUMMER, n.: *Blatta gigantea*, the largest of all the species of *Blattidæ*, or cockroaches. It measures about three inches in length. It is an inhabitant of S. America and the W. Indies, and obtains its name from its habit of producing a noise with its head resembling a sharp knocking with the knuckles against wainscoting. It is said sometimes to devour the extremities of the dead, and even to attack people when asleep. It is a handsome insect, being of a pale yellow color.

DRUMMOND, *drŭm'ond*, Sir GEORGE GORDON: 1771-1854, Oct. 10; b. Quebec: soldier. He entered the British army as ensign 1789; became lieut.col. 1794; served with distinction in the Holland campaign 1794–5, and in Egypt 1800; was staff-officer at Jamaica several years; on duty in Canada 1808–11; promoted lieut.gen. 1811; again ordered to Canada as second in command under Sir George Prevost 1813; planned and effected the capture of Fort Niagara, and planned the successful attack on Black Rock and Buffalo; led a combined military and naval force against Oswego and destroyed the American works and stores 1814, May; was in command of the British forces at the battle of Lundy's Lane July 25; and invested but failed to capture Fort Erie, Aug. In 1815 he was appointed gov. gen. of Canada, resigned and returned to England, and 1817 received the grand cross of the order of the Bath.

DRUMMOND, HENRY: b. Scotland, 1851; d. 1897, Mar. 11: scientist. He was educated at a school in Stirling and at Edinburgh Univ., and after taking a special course at Tübingen Univ. applied himself to the study of natural science, and was appointed lecturer on the subject in Free Church College, Glasgow, 1877, and subsequently professor. Prior to this he had become conspicuous in religious circles of Scotland by an address before the theol. soc. of New College on *Spiritual Diagnosis*, 1873, in which he contended that an indispensable part of a successful minister's work was individual dealing with souls, that in a few minutes' conversation with a young man the discovery might be made of his individual need, and the proper teaching applied. The same year Messrs. Moody and Sankey made his acquaintance, were impressed with his religious fervor, and induced him to accompany them on their evangelistic tour. For several years it was his privilege to address regularly two very different audiences on two very different themes. On week days he lectured to a class of students on the natural sciences, and on Sundays to an audience consisting for the most part of workingmen on subjects of a moral and religious character. For a time he succeeded in keeping science and religion separate, but gradually the subject-matter religion took on the method of expression of science and he found himself enunciating spiritual laws in the exact terms of biology and physics. These addresses he published under the title of *Natural Law in the Spiritual World* (1883). He has since lectured in the United States and published *Pax Vobiscum*, and *The Greatest Thing in the World* (1890); *Tropical Africa* and *The Programme of*

Christianity (1891); *The City Without a Church* (1893); and *The Ascent of Man*, Lowell lectures on *Evolution* (1894).

DRUMMOND, Captain THOMAS, R. E.:1797-1840, Apr. 15; b. Edinburgh. During his professional training at Woolwich and Chetham he showed high mathematical and mechanical abilities, with aptitude for the practical application of scientific principles. In 1820, he was an assistant in the trigonometrical survey of the United Kingdom. The incandescence of lime having been brought under his notice at a lecture on chemistry, he made experiments with a view to its application for light on distant objects in the survey, and the result was the Drummond light: see DRUMMOND LIGHT: also *Philosophical Transactions*, 1826. He invented a heliostat or reflecting mirror described in the same paper. Experiments for adapting his *Light* to lighthouses, are detailed in the *Philosophical Transactions*, 1830. His attention being diverted to political life, he filled some minor offices, and 1835, went to Dublin with Lord Mulgrave as under-sec. for Ireland. Here he at once gained the confidence and affection of the people. In a letter written by him to the magistrates of Tipperary, 1838, May 22, he used the words—'Property has its duties as well as its rights;' an aphorism which instantly flew over Ireland. He was the head of a commission appointed 1836 to report on a railway system for Ireland—a laborious and valuable service. His labors overtasked his strength, and he died, lamented by the Irish people. A statue by Hogan was erected to his memory by public subscription in the Royal Exchange at Dublin; and a memoir of his professional life (abridged in Knight's *English Cyclopædia of Biography*, II, 647) was published 1841 by Captain Larcom, R.E., in vol. IV. of *Papers on Subjects Connected with the Duties of the Corps of Royal Engineers.*

DRUM'MOND, WILLIAM, OF HAWTHORNDEN: poet: 1585, Dec. 13—1649, Dec. 4; descended from a very ancient and noble Scottish family. He was educated at the High School of Edinburgh, and at the Univ. of Edinburgh, where he took his degree M. A., 1605, July 27. On leaving college he was sent to the continent in order to study law. He returned 1609, and at the death of his father in the following year, he retired to the paternal estate at Hawthornden, which, according to the learned Ruddiman, 'was a sweet and solitary seat, and very fit and proper for the muses;' and there, with an interval of eight years of foreign travel, spent his life in his favorite literary pursuits. His death, it is said, was hastened by his excessive grief for the fate of Charles I. His principal works are the following: *Tears on the Death of Mæliades*—Prince Henry, son of James I.—(Edin. 1613); *Poems: Amorous, Funerall, Divine, Pastorall, in Sonnets, Songs, Sextains, Madrigals* (1616); *Forth Feasting* (1617); *Flowers of Zion* (Oxford 1623). After relinquishing poetry, he wrote a sectional History of Scotland, known as the *History of the Five Jameses.* A standard edition of his poems was edited for the Maitland Club by Dr. Irving and Lord Dundrennan 1832. Smaller editions appeared 1833

and '56, and an exhaustive Life, with an account of his writings, by Prof. Masson, 1873. Drummond's *Notes of Ben Jonson's Conversations with William Drummond of Hawthornden*, is a characteristic record of the literary spirit of the time.

His sonnets are the best specimens of his muse, though even in them one looks in vain for sustained harmony or great originality of thought.

DRUMMOND, William Henry: b. County Leitrim, Ireland, 1854; d. 1907, April 6. He was brought to Canada at an early age and graduated as M. D. from Bishop's College, Lennoxville, 1884; practiced in Montreal; developed a new line of literary dialect work in Canada, ranking with Haliburton, and bringing the author permanent fame. His works include: *The Habitant and Other French-Canadian Poems* (1898); *Philorum's Canoe and Madeleine Vercheres* (1898); *Jonnie Courteau and Other Poems* (1901); *The Voyageur and Other Poems* (1906).

DRUM'MOND LIGHT, or Lime'light: brilliant light, practically applied by Capt. Drummond, R. E. (see Drummond, Thomas). The heat given out during the combustion of a mixture of hydrogen and oxygen gases, or of coal-gas and oxygen is intense; and when the mixture is directed on an infusible substance such as lime, a most brilliant light is evolved.

DRUNK, a. *drŭngk* [from Drink, which see]: overcome by alcoholic liquor; intoxicated; stupefied by the action of spirit on the stomach and brain. Drunk'en, a. *-ĕn*, given to over-indulgence in alcoholic liquor; done when intoxicated, as a *drunken* frolic. Drunk'ard, n. *-ĕrd*, one given to the excessive use of strong drink. Drunk'enly, ad. *-lĭ*. Drunk'enness, n. *-ĕn-nĕs*, habitual intemperance; inebriety.

DRUNK'ENNESS: see Intoxication: Delirium Ebriosum: Delirium Tremens: Total Abstinence.

DRUPE: n. *drôp* [F. *drupe*—from L. *drupa:* Gr. *druppa*, an over-ripe wrinkled olive; Gr. *drupĕpĕs*, a ripe olive]: in *bot.*, succulent fruit containing a single seed or kernel which is usually inclosed in a hard 'stone,' the *endocarp*. The succulent part is the *mesocarp*. Examples are familiar in the fruits known as stone-fruits, the peach, plum, cherry, etc. In the almond, the mesocarp is not succulent, yet the fruit otherwise possessing all the characters of a drupe, receives that name: it may be regarded as intermediate between a drupe and a nut. The date is a drupe in which the hard 'stone' is represented by a membrane. Drupaceæ, species of plants, sometimes assigned as a sub-order of *Rosaceæ* (q.v.); with fruit indehiscent, one-celled, and one-seeded; e.g. the peach and cherry. Drupel, n. *drô'pĕl*, many tiny drupes aggregated in such a fruit as the raspberry, the blackberry, etc., of the genus *Rubus*. Drupa'ceous, a. *-pā'shŭs*, having the form of a drupe; consisting of or producing drupes.

DRUPOSE, n. *drô'pōz* [Eng. *drupe*, and glucose]: in *chem.*, a substance produced together with glucose by the

action of moderately diluted hydrochloric acid on glycodrupose, the stony concretions found in pairs. It is a grayish-red body. By boiling it with dilute nitric acid, and treating the residue with water, ammonia and alcohol, yellowish white granules are obtained, which exhibit the properties of cellulose.

DRURY, *drō′rĭ*, DRU: 1725, Feb. 4—1804, Jan. 15; b. London: goldsmith, silversmith, and cutler, in London. He applied himself to the study of entomology and the collection of exotic insects. His *Illustrations of Exotic Entomology* (2 vols. Lond. 1773–82), a work unrivalled at its publication for the accuracy and beauty of its figures, is still in repute as a book of reference.

DRUSE, n. *drôs* [Gr. *drŏsŏs*, dew: Ger. *druse*]: a hollow or cavity in rocks lined or studded with crystals, sometimes filled with water. DRUSY, a. *drô′sĭ*, lined with very minute crystals.

DRUSES, n. plu. *drô′zĕs:* remarkable people who inhabit a district in the n. of Syria, comprising the whole of the s. range of Mount Lebanon and the w. slope of Anti-Lebanon. They speak Arabic, and are nominally Mohammedans, but with some slight leavening of Christianity, and much mysticism, in their Deistic creed. In the district above noted, they hold exclusive possession of about 40 towns and villages, and divide about 200 more with the Maronites (q.v.), while 80 villages in other parts of Anti-Lebanon are peopled by them. The inhabitants of the Lebanon afford a remarkable illustration of the amalgamation of races. After the second captivity of Israel, Esarhaddon re-peopled the wasted strongholds of Samaria with certain fierce tribes, some of whom, called in the Scriptures Cuthites, and known in subsequent times to the Greeks as Carduchi, and to us as Kurds, settled in Lebanon. From them the present Druses are supposed to have sprung. More than a thousand years later, a fresh colonization took place. The Mardi, a warlike tribe who dwelt n. of the Caspian, of Persian extraction, were transplanted thither by Constantine IV., A.D. 686, to the number of 12,000, to act as a bulwark against Mohammedan invasion. The Arabs also, in sweeping through the mountain-fastnesses, left a permanent impression there. Thus, Cuthites, Mardi, and Arabs, or rather Mohammedans of various races, have combined to form that strange being—the modern Druse. It has been supposed by some that there runs in his veins also not a little of the blood of the Crusaders, but this is doubtful. No immigrations, however, of any importance into the country of the Druses took place after the close of the 10th c.; and this period seems naturally to conclude the first great section of Druse history.

The nationality of these mountaineers having now been consolidated, their peculiar and mysterious religion began gradually to be developed. Hakem Biamr Allah, or Bemrillah, caliph of Egypt, and a Nero in cruelty, was the author of this system. He affirmed that he was the representative of God, and, having enlisted his confessor,

Darazi, in his cause, he prepared to propound his doctrine. In the 407th year of the Hegira (1029), the divine nature of Hakem, or rather the incarnation of the Spirit of God in him, was publicly announced at Cairo. This revelation however, was unfavorably received by the mob. Hakem's confessor, Darazi, narrowly escaped the fate of a martyr to the impostures of his master. Retiring, however, to the fastnesses of the Lebanon, he there began to inculcate the principles of the new faith; and though he never acquired any mastery over the sympathies of the mountaineers, he at least left his name to them; for there can be little doubt that the name Druses is derived from that of Darazi. Hamzé, Persian mystic, successively disciple and vizier of Hakem, introduced into the newly promulgated religion all the elements of attraction and strength which it possesses; and him the Druses venerate as the actual founder of their faith.

The Druses are one of the very few sects among whom proselytism is discouraged. They are remarkable conservatists. For 800 years they have maintained a distinct religious and political independence and nationality. Into their faith the doctrines of the Pentateuch, the Christian Gospel, the Koran, and the Sufi allegories, are wonderfully interwoven. They reject, however, the seven points of Islamism, substituting for them the following seven:—1. Veracity (to each other only); 2. Mutual protection and resistance; 3. Renunciation of all other religions; 4. Separation from all who are in error; 5. Recognition of the unity of God; 6. Resignation to his will; 7. Obedience to the commands of God. They believe in one God in whom there are no parts, to whom they ascribe no attributes, before whom the tongue ceases to utter, the eyes to behold, but who has revealed himself ten times upon the earth under the form and name of mortal men. In Hakem, so Hamzé taught, had God revealed himself for the tenth and last time. They believe also that the number of existing souls never varies, and that all the souls in life now, have lived, vested in some human form, from the beginning of the world, and will so continue till the end of it; that when a man dies, his soul puts on a fresh humanity, which occupies a rank in moral dignity corresponding to the purity or impurity of the past life. But though they believe, in this sense, in the transmigration of souls, they believe also that after the lapse of ages, when the soul will have been purified from every stain, there will come a period of rest. As a religious body, the Druses are divided into two classes: the Akals, or those initiated into the Druse mysteries; and the Djahils, the uninitiated. The former do not adorn themselves with gold, or wear silk, embroidered, or fanciful garments; they forbear using wine, spirits, tobacco, and other luxuries; never swear, utter obscene language, or lie. The latter are free from all religious duties. But, however rigid the profession of the Akal or initiated Druse, he is taught that his practice may be conducted in some cases on the principle of ex-

pediency. To be truthful, he is taught, is desirable; but when concealment is necessary, then equivocation, or even falsehood, may be practiced.

Previous to 1840, Druse and Maronite lived on terms of intimacy and friendship. At that period, however, dissension sprang up between the two tribes, and proved to be the introduction to years of intermittent warfare. The strife reached its climax in 1860. From May to October of that year, accounts of the fearful barbarities practiced by the Druses upon the Maronites followed each other with appalling frequency, until the indignation of Europe was roused against them. A conference of the five Powers which had guaranteed the independence of Turkey met at Paris, and it was resolved that a French army should proceed to Syria to chastise the Druses, and that, at the same time, a European commission should, on the spot, make inquiry as to the facts. The troops reached Syria, 1860, Aug. They could not, however, get access to the Druses, who retired into the Desert of the Hauran. In the meanwhile, it was ascertained beyond all doubt that the Turks, and the low fanatical mob of Damascus (who have frequently been confounded with the Druses, because they fomented their passions), were mainly chargeable with the crimes that had been committed; and that the retaliation of the Maronites was equally vindictive and horrible. It is stated that the Maronite leaders —in most cases bishops—on being asked to furnish sworn lists of such of the Druses as, from the unusual atrocity of their crimes, were worthy of death, sent in a list demanding 4,946 heads; refusing, however, to bring forward any particular charges. Punishment was inflicted on those who were found really to blame. While the French troops remained in Syria, the Turks were compelled to punish the chief Mohammedan criminals, a considerable number of whom, including Achmet Pasha, gov. of Damascus, were shot. In June, 1861, the troops returned to France, and the commissioners drew up a new constitution for the Lebanon, finally revised and signed, 1864, Sep. 6. Under it, the Lebanon is to be ruled by a Christian governor, appointed by the Porte; and to be divided into seven districts, under chiefs of the prevalent religion in each. The result was the appointment as gov., of Daoud Pasha, an Armenian Christian, and of 7 chiefs (4 Maronite, 1 Druse, 1 Orthodox Greek, and 1 Separatist Greek). The constitution did not satisfy the Maronites, whose revolt under Joseph Karam kept the Lebanon in a very unsettled state till 1867. During this period, the governor had to restrain the Druses from attacking the Maronite villages in the absence of their defenders. The Druses are about 80,000 in number; they are a brave, handsome, and industrious people, and almost all can read and write. They had no high educational establishment until Daoud Pasha founded and endowed one at Abey. Polygamy is unknown among them. They have, with incredible toil, carried the soil of the valleys up and along the hillsides,

which are laid out in terraces, planted with mulberry, olive, and vine. Their chief trade is the manufacture of silk. Grain also is raised, though in very small quantity. Deir-el-Kamar is the principal town. See *Druses of the Lebanon,* by the Earl of Carnarvon; Guy's *La Nation Druse;* Oliphant's *Land of Gilead* (1880).

DRUSUS, *drô'sŭs:* distinguished family of the gens Livia, which contributed a large proportion of eminent men to the Roman commonwealth. The most conspicuous of the Drusi, were the following:

M. Livius Drusus, tribune of the people, B.C. 122, who made it the business of his public life to thwart the democratic policy of his colleague, C. Gracchus, and uphold the cause of the senate and nobles, which he did with skill and ultimate success.

M. Livius Drusus, son of M. Livius, dangerous and daring political intriguer. Acting partly for the benefit of the aristocratic party whose sympathies he inherited, and not less for his own aggrandizement, he kept Rome in perpetual turmoil from B.C. 100 till his death, B.C. 91. Though identified by birth and sympathy with the patricians, Drusus, to win the people, renewed some of the most liberal measures of the Gracchi, and carried agrarian and frumentarian laws. During the latter years of his life, he contrived to gather into his own hands the threads of the various political movements which resulted in the Social War; but his almost incredible pride and arrogance had made him so many enemies, that his death, in the flower of his age, was regretted as little by his friends as by his foes.

Nero Claudius Drusus, most illustrious of the Drusi; commonly called Drusus Senior, b. B.C. 38; stepson of the emperor Augustus, and younger brother of the emperor Tiberius. He early developed splendid personal qualities as well as the highest capacity for civil and military affairs. He began his public career B.C. 19, and signalized himself when only 23 years old by his defeat of the Rhæti and other Alpine tribes which infested n. Italy. In B.C. 13 he was sent into Gaul, then in revolt, and, after crushing the rebels there, pushed across the Rhine in pursuit of their German allies. In this campaign he subdued the Sicambri and Frisii, and forced his way to the German Ocean, being the first Roman general who had done so. From this time he made the business of his life to establish the Roman supremacy in Germany, partly by conquest, and partly by the execution of great military works. Among these were the canal joining the Rhine with the Yssel, the two bridges over the Rhine itself, and the embankments of the Vahalis, the Waal. In B.C. 11 he conquered the Usipetes, the Cherusci, and the Suevi; in the following year, the Chatti, the Nervii, and was prosecuting the work of subjugation in B.C. 9, when a fall from his horse cut short his brilliant career in his 30th year. For his exploits in Germany, Drusus was rewarded with the title of Germanicus, but care must be taken not

to confound him with the celebrated Germanicus, his son. See GERMANICUS.

DRY, a. *drī* [AS. *drig;* Dut. *droog;* Ger. *trocken;* Icel. *thurr;* Dan. *tor,* dry, arid]: free from water or moisture; not rainy; not juicy; arid; thirsty; barren; void of interest, as applied to a book, a discussion, etc.—as applied to persons, sarcastic; severe; humorous; stupid; silly; insipid; not sweet; in *art,* exhibiting a sharp, frigid preciseness of execution, or want of a delicate contour in form, and of easy transition in coloring: N. in *mason.,* a crack or fissure in a stone running through it at various angles to its bed, and rendering it unfit to carry any load; in *chem.,* an emetic consisting of tartarized ammonia and sulphate of copper in equal proportions and taken without liquid: V. to free from water or moisture, as by wiping; to lose moisture. DRY'ING, imp. DRIED, pt. or pp. *drīd.* DRY'ER, or DRI'ER, n. that which dries: a substance mixed with oil-paint to make it dry more quickly. DRYLY, or DRILY, ad. *drī'lĭ,* without moisture; coldly; without affection; sarcastically. DRY'NESS, n. want of moisture; in *painting,* technical term for a style in which the drawing is hard, angular, and formal, and the color deficient in harmony and mellowness, though not necessarily in power or richness. The earlier works, both of the Italian and Flemish schools, all have this defect; and it is the prominent characteristic of those of their imitators to whom the name of pre-Raphaelites has been given. DRY-ARCH, n. in *arch.,* employed in the foundations of buildings for the purpose of keeping them dry. DRY-BLOW, n. a hard or sharp blow; in *med.,* a blow which neither wounds nor sheds blood. DRYFOOT, n. a dog that hunts by the scent of the foot only. DRY-FRUIT, n. in *bot.,* one without pulp. DRY-GILDING, n. a mode of gilding, by steeping linen rags in a solution of gold, burning the rags, and with a piece of rag dipped in salt-water rubbing the ashes over the silver to be gilded. The method was invented in Germany, and is first described in England in the *Philosophical Transactions* for 1698. DRY-GOODS, woolen and cotton cloths, etc., as distinguished from groceries. DRY-POINT, sharp etching-needle used to incise fine lines in copper, without the plate being covered with etching ground, or the lines bitten in by acid: see ENGRAVING. The work produced by the dry-point is not only very delicate, but it wears less in printing than lines produced by acid. DRY-POINTING, n. the grinding of needles and table-forks. DRY-ROT, a rapid decay of timber by which its substance is converted into a dry powder. DRY'SALTER, n. *-sawl-tĕr, formerly,* a dealer in dry or salted meats; *now,* a dealer in gums, drugs, dyestuffs, and in chemical substances generally. DRY-NURSE, a woman who brings up children without the breast. DRY-PILE, galvanic or voltaic battery without liquids, supplying a feeble current: see GALVANISM.—DRY-PIPE, n. in *steam-eng.,* a pipe which conducts dry steam from the boiler. The steam is collected in such a manner as to be free from priming. DRY-SHOD, without wetting the feet.

Dry stove, in *gardening*, Eng. term for a hothouse in which the air is kept less moist than in the bark stove. In structure and in management, except that the temperature is kept higher, it agrees more nearly with the greenhouse. The dry stove is particularly adapted to succulent plants. Dry-wines, wines free from sugary matter.

DRYAD, n. *drī′ăd* [L. *dryădēs*, nymphs of the woods—from Gr. *drus*, an oak-tree]: inferior deity or a nymph supposed in Gr. myth. to watch over woods; the appointed guardians of the larger forest trees with which they came into being, and with which they died.

DRYANDRA, n. *drī-ăn′dra* [named after M. *Dryander*, a Swedish botanist]: in *bot.*, genus of evergreen shrubs, belonging to the order *Proteaceæ*, natives of Australia, cultivated in other countries for the variety of the forms and colors of the leaves. The flowers are yellow, formed in cylindrical clusters.

DRYAS, n. *drī′ăs* [Gr. *druas*, a Dryad, a nymph of the oak. So named from the leaves bearing some resemblance to those of the oak]: in *bot.*, a genus of plants belonging to the ord. *Rosaceæ*. They are small, low shrubs, bearing white or yellow flowers, with long feather-awned achenes.

DRY-AS-DUST, n. *drī′ăs-dŭst* [Eng. *dry-as-dust*]: a very dull prosy author, an antiquary.

DRYDEN, *drī′dĕn*, John: poet: 1631, Aug. 9—1700, May 1; b. Aldwinkle, Northamptonshire, England. His father, Erasmus Driden, was the third son of Sir Erasmus Driden, created baronet 1619. Dryden received the rudiments of his education at Tichmarsh, and was afterward admitted a kings' scholar at Westminster School, under Dr. Busby. Here, 1649, he wrote an *Elegy on the Death of Lord Hastings*, and some commendatory verses on the *Divine Epigrams* of his friend John Hoddesdon; both of which performances were published 1650. In 1650, May, he was elected to a scholarship in Trinity College, Cambridge; he took the degree B.A. 1653–4; and was made M.A. 1657. His father dying 1654, left him an estate worth £60 per annum, of which sum his mother had life-interest in a third. After leaving the univ. he went to London, under the patronage of Sir Gilbert Pickering, who was faithful to the Protector, and seems to have aroused for the time the same feeling in his protege, whose first poem of importance was entitled *Heroic Stanzas on the Death of Cromwell*. On the return of Charles II., Dryden with equal splendor of diction, and perhaps with equal sincerity, congratulated the Restoration.

The publication of a poem, entitled *Astræa Redux*, led to a breach between the poet and the family of Sir Gilbert Pickering, and Dryden now became author by profession. He turned his attention to the stage, planned *The Duke of Guise*, and wrote his first acted play, *The Wild Gallant*. In 1663, Dec., he married a daughter of the first Earl of Berkshire, with whom he received a portion; and in 1670

he was appointed poet laureate and historiographer, with a salary of £200 a year. He afterward entered into an engagement with the theatres to supply them with three plays each year, for which he was to receive annually from £300 to £400; but as he did not fulfil his share of the contract, it is not probable that the theatres fulfilled theirs. In 1671, the Duke of Buckingham produced his attack on the English heroic drama, of which Dryden was then the head. This satirical piece was entitled *The Rehearsal*, and when it was brought on the stage, the town was amused. Although personally satirized, Dryden endured his castigation in silence, and, waiting his opportunity, immortally revenged himself on the witty and profligate duke in the *Absalom and Achitophel*, 1681. This magnificent satire arose out of the political commotions of the times, and is an elaborate defense of the king against the whig party. Charles II. is *David;* Monmouth, *Absalom;* Cromwell, *Saul;* Buckingham, *Zimri;* and Shaftesbury, *Achitophel.* Its success was amazing; it ran through five editions within the year. This great poem and its success enraged Dryden's enemies, who hovered around him like a cloud of gnats. In the same year he published *The Medal.* Elkanah Settle, one of the most virulent of his foes, replied with some effect; and Dryden, thoroughly roused, issued next year the *Mac Flecknoe*, and the second part of *Absalom and Achitophel.* These satires were as overwhelming as the Italian battles of the first Napoleon; Dryden's enemies were crushed forever, and he remained during his lifetime the undisputed king and lawgiver of English literature.

After the death of Charles II, Dryden became a convert to the Rom. Cath. faith. This event was announced to the world by the publication of *The Hind and Panther*, 1687. For this change of faith, he has been much abused. Macaulay calls him 'an illustrious renegade.' Mr. Bell, one of his biographers, strenuously defends his conscientiousness. At the revolution, he was deprived of his laureateship, and somewhat straitened in circumstances, he fell back upon his old occupation of writing for the stage. His translation of *Virgil* was begun 1694, and completed by the close of 1696. A month after the publication of *Virgil*, appeared the *Ode on Alexander's Feast.* In 1698, he commenced his *Fables*, and completed them in a year and a half. His last work was a masque, with prologue and epilogue. He was buried in Westminster Abbey, where a monument was erected to his memory by John, Duke of Buckingham.

Though the great bulk of Dryden's works is composed of plays, and though these are, for the most part, devoid of character, feeble in sentiment, false to all external nature, and exaggerated in expression, he remains one of the prime glories of English literature. His *Satires* and his *Fables* are master pieces. In these, he is almost always masculine and natural, and his versification flows on broad, deep and majestic. Nor is it only as a poet that he excels; his

prefaces and *Essay on Dramatic Poesy* show him a master of 'that other harmony of prose.' His works, in 18 vols., were edited by Scott.

DRYITE, n. *drī'īte* [Gr. *drus*, a tree, an oak]: in *geol.*, a name applied to fragments of petrified or fossil wood, in which the structure of the wood is recognizable.

DRYOBAL'ANOPS: see CAMPHOR.

DRYOPHIS, *drī'ofĭs:* genus of serpents of the family *Colubridæ*, allied to *Dendrophis*, and, like those of that genus, of very elongated form and living mostly among the branches of trees, but distinguished by a projecting muzzle—a curious prolongation of the upper jaw, which in some is slender, in some leaf-like. They are natives of the E. Indies, Madagascar, and tropical America.

DRY PRO'CESS: see PHOTOGRAPHY.

DRY ROT: a kind of decay, often very rapid to which timber is subject, without the presence of much moisture. It has proved ruinous to many valuable edifices, and has caused many serious accidents. The ends of joists are often affected by it, so that upon being burdened with even a slight additional load, they are ready to break off by the wall; and the process of destruction has often gone far without a suspicion being entertained of anything wrong. Dry rot is occasioned by *fungi*, the *mycelium* of which diffuses itself through the substance of the timber, destroying its texture and reducing it to a fragile or even friable mass, while the surface may show scarcely any signs of decay. *Merulius lacrymans*, *M. vastator*, and *polyporus destructor* (see AMADOU), are species commonly productive of this mischief. Other *fungi*, however, produce the same effects where none of these are present; but besides the species which are well ascertained, there are some forms of mycelium frequently occurring as dry rot, of which it is uncertain to what fungus they ought to be referred, as they have not been observed to develop themselves in any perfect form, while also it is not known what different modifications of appearance the mycelium of the same fungus may show in different circumstances. Very destructive ravages have been ascribed to different species of *sporotrichum*, particularly in the naval yards of Britain, but the genus is altogether a doubtful one, and not improbably consists of mere forms of undeveloped mycelium. Several species of fungi are often present together in timber affected with dry rot. Some penetrate deeply into the substance of the timber, others spread more superficially, but attract moisture from the atmosphere, which hastens decay. This is the case with *merulius lacrymans*, which appears first in small white points; a filamentous substance, radiating from these, gradually forms broad patches, sometimes many feet in diameter; from these, long creeping shoots often proceed, and a net work of filaments penetrates into every crevice. The species of *polyporus* more generally fill the whole mass of the timber with delicate filaments, which destroy the cohesion of its fibres. *Dædalea quercina* appears in the form of

leathery laminæ, often in the strongest oak, and the delicate threads of mycelium penetrate every duct and cavity, reducing the whole to a fungous mass. Beautiful orange tufts sometimes appear, supposed to be the mycelium of species of *coprinus*.

Of the causes of dry rot stagnation of air, as behind a wainscot or under a floor, is certainly one of the chief; and a knowledge of it suggests means of prevention which may often be easily and advantageously employed. Another principal cause is insufficient drying of the timber itself; and much of the prevalence of dry rot is probably due to the practice of felling oak in spring for the sake of the bark, when the wood is full of sap. Any circumstance which may tend to render the sap acidulous, greatly increases the liability to dry rot. The production of fungi is unusually rapid when by fermentation or otherwise an acidulous condition of organic substances is produced. A fermentation and chemical change in the albuminous constituents of the wood, is probably the immediate cause of dry rot, providing a soil suitable for the vegetation of fungi.

Among the methods for the prevention of dry rot—in addition to the freer circulation of air and more thorough seasoning of the timber—the expulsion of the sap and impregnation by means of an air pump, with some substance of an antiseptic nature is the most promising. In 1832 Ryan invented his famous preservative consisting of one lb. of bichloride of mercury to four gallons of water. Others have used chloride of zinc, sulphate of copper, oil of creosote, and similar substances. The dissipation of the sap followed by the subjection of the wood to the vapor of coal tar, resin, or bituminous oils, at a temperature of 325° also is a successful method of more recent introduction. Fluids readily follow the grain of the wood, but penetrate it slowly in other directions; therefore the pressure upon wood to be impregnated with a preservative must be exerted endwise. The ordinary degree of force is 150–200 lbs. per sq. inch. The quantity of the solution absorbed varies with different kinds of wood from about two and one-half to three and three-fourths lbs. per cubic ft. in a period of seven days. The strength of the timber is not diminished by these solutions. Timber that is thoroughly seasoned and properly protected may retain its integrity for a long period as is proved by the sound condition of the wood in several English structures which were erected about 1,000 years ago, and by the fact that perfectly sound wood has been taken from the frieze of the Parthenon where it had been more than 2,300 years. Also charred wood has been found in the ruins of Nineveh.

DRY TORTUGAS, *tawr-tô'gas:* cluster of 10 small islands belonging to Monroe co., Fla., 40 m. w. of Fla. Keys proper, 120 m. w.s.w. of the s. extremity of the mainland at the entrance of the Gulf of Mexico; lat. 24° 37′ n. long. 83° w. They are very low and covered with mangrove bushes where not wholly barren. The U. S. govt. has erected two important light-houses, one on Logger-

head Key, the other inside Fort Jefferson on Garden Key. During the civil war these islands were used as a place of confinement for deserters, bounty jumpers, and persons under court martial sentence, and afterward the conspirators in the Lincoln assassination who escaped hanging were sent there.

DUAL, a. *dū'ăl* [L. *duālĭs*—from *dŭŏ*, two]: expressing the number two. Du'ad, n. *-ăd*, a union of two. Dual, in *gram.*, form given in some languages to a noun or a verb, when only two things are spoken of. Thus, in Greek, *pater* is father; *patere*, two fathers; *pateres*, fathers. It is only in some of the more ancient languages that we find traces of a dual number, and it becomes lost as the power grows of analyzing concrete impressions. Sanskrit, ancient Greek, Arabic, and Hebrew have the dual number, the last only in nouns. Modern Greek has lost the dual. The only trace of it in Latin is in the two words *duo*, two, and *ambo*, both. It is wanting in the Germanic languages, with the exception of the ancient Gothic, which has a dual form of the verb. In Anglo-Saxon, there was a separate form of pronoun for 'we two' (*wit*) and 'ye two' (*git*). Dualism, n. *-ăl-ĭzm*, philosophical theory, according to which some two principles, of different nature, originai, and incapable of being derived the one from the other, are at the foundation or the origin of everything; as for example, the ideal and the real, or the material and the thinking substance. In a theological sense, dualism means the assumption of two original beings, a good and an evil, as in the doctrine of Zoroaster, or of two distinct principles in man, a bodily and a spiritual. The opposite of dualism is Monism. Du'alist, n. *-ĭst*, one who adopts dualism. Du'alis'tic, a. *-ĭs'tĭk*, consisting of two. Dual'ity, n. *-ăl'ĭ-tĭ*, state or quality of being two; that which expresses two. Dualin, explosive compound of two substances, nitro-glycerine and sawdust, intended to be less dangerous in storage and transportation than nitro-glycerine alone. Dualistic-system, in *chem.*, the theory that salts are formed by the action of two binary compounds.

DUAL ALLIANCE: reported alliance between France and Russia (1896–7). It is positively but not officially stated that a formal agreement between the French and Russian governments was signed at Moscow on the eve of the coronation of Nicholas II. The two powers are said to have mutually agreed to defend the integrity of their territory, undertaking to defend each other against all foreign aggression, but reserving their liberty of action in the event of either power beginning an aggressive campaign against any other state. By the French constitution such a treaty could not become definitely binding until adopted by the *Corps Legislatif* after public discussion; but that an *entente cordiale*, or cordial understanding, exists between the empire and the republic has long been evident. When the czar visited Paris in 1896 he was received not only with the highest official courtesy, but with an unexampled outburst of popular enthusiasm. He was met,

Oct. 5, 15 miles off the French coast by the French fleet and escorted into the harbor of Cherbourg. There he was received by Pres. Faure and other high officials. Numerous presentations followed; also an inspection of the French squadron. After an official banquet in the evening, at which the czar and Pres. Faure toasted each other in cordial but guarded terms, the imperial party started for Paris, where they arrived the following morning. There was (Oct. 6–9) a constant round of gorgeous festivities, and official ceremonials marked by such a display of pageantry and such an enthusiasm of popular excitement as had never been equalled in the history of international festivals. Among the noteworthy features were: the laying of the foundation-stone of the exhibition bridge—*Pont Alexandre III.;* the appropriation of 200,000 francs for the payment of rents for the poor, instead of free wine, as had been customary on similar occasions; and the great military review of the French troops by the czar at Chalons. The *fêtes* are estimated to have cost more than 12,000,000 francs. This was the first time since the formation of the Third Republic, 25 years before, that France had received as her guest a great European potentate, and in the visit of the czar to Paris Frenchmen saw an ostentatious political demonstration giving proof to the world that the *entente* of France with one of the greatest powers of history was now not only an acknowledged but a demonstrated fact; that France had now fully emerged from the long period of isolation and humiliation following the Franco-Prussian war, and had at last recovered her rank among the great European powers. The visit of the czar was returned by Pres. Faure (1897, Aug.), who was received with great distinction by the czar, court, and people. At the farewell naval review, the czar spoke of 'our two nations, friends and allies,' and the Russian fleet resounded with cries of *'Vive l'Alliance'* as the French fleet stood out to sea. The alliance is useful to Russia, as securing her against any alliance of France with England against Russia, as in the Crimean war in 1853; to France it is useful, as enabling her to maintain herself against Germany, though it is not generally believed that Russia would aid France in an offensive war to recover Alsace and Lorraine; to both nations the new alliance is valuable as a check to the power and the possible ambitions of the Triple Alliance that dominates central Europe.

DUALISM, in philosophy: see METAPHYSICS.

DUANE, *du-ān'*, JAMES: 1733, Feb. 6—1797, Feb. 1; b. New York: lawyer. He inherited a large estate at Duanesburg, married a daughter of Robert Livingston, and became eminent as a lawyer. He was a member of the continental congress during its entire existence, of the N. Y. provincial congress 1775–77, and of the committee of safety. In 1776, he opposed the Declaration of Independence, urging that the action should not be taken before the arrival of the royal commissioners, nor before the people had expressed a desire for a change of govt. He was

elected the first mayor of New York under the new charter, 1784–89, state senator 1782–85 and 1789–90, member of the convention that ratified the constitution 1788, and U. S. dist. judge 1789–94.

DUANE, James Chatham: 1824, June 30—1897, Nov. 8; officer U.S.A. engineers: b. Schenectady, N. Y. On graduating at Union Coll. 1844 he entered West Point. Milit. Acad., and 1848 received a commission in the engineer corps; was asst. instructor at West Point till 1856; inspector of light-houses at New York 1856–58; served in the Utah expedition 1858; was instructor at West Point again till 1861. Assigned to duty in the army of the Potomac in the winter of 1861, he served in the Peninsular campaign, organizing the engineer service and constructing important works. He was chief of the engineers in the Md. campaign, and was in the South Mountain and Antietam engagements; chief engineer of the dept. of the South 1863, and of the army of the Potomac again the same year, thus participating in many memorable operations, as those at Ft. McAllister, Charleston, Manassas Gap, Cold Harbor, Petersburg, etc. After the war he was employed in erecting fortifications on the n.e. coast, and as pres. of the board of engineers at New York till 1886, when he became brig.gen. and chief of engineers. He retired 1888, and became pres. of the aqueduct commission, New York.

DUANE, William: 1760–1835, Nov. 24; b. near Lake Champlain, N. Y.: journalist. He went to Ireland at an early age, learned the printer's trade, received an appointment in the East Indian service, became wealthy, and established *The World* newspaper. Having criticized the local govt., he was seized by Sepoys while on his way to dine with Sir John Shaw, and sent back to England, and all his property was confiscated. He resumed journalism in London, while vainly endeavoring to secure the restoration of his property, returned to the United States 1795, and soon afterward became editor of the Philadelphia *Aurora*, an influential democratic organ. Pres. Jefferson appointed him lieut.col. in the army, 1805, July, and he served through the war of 1812–15, as adj.gen. In 1822 he retired from the editorship of the *Aurora*, and after visiting the republics of S. America became supreme court prothonotary at Philadelphia, and held the office till death. He was author of *The Mississippi Question* (1803), a *Military Dictionary* (1810).

DUB, n. *dŭb* [Fris. *dobbe*, a puddle, a swamp: Scot. *dub*]: a small pool of rain-water; a puddle; a gutter.

DUB, v. *dŭb* [Prov. *adobar*, to arrange, to prepare: F. *adouber*, to rig or trim a ship: Sp. *adobar*, to dress or make up anything; but probably the root is no other than the OE. *dup*, a contraction for *do up*, to dress, to invest with: comp. Icel. *dubba*, to strike]: to confer the title of knighthood by a slight tap with a sword; to invest with any dignity or new character; to cut down or dress with an adze,

as a plank; to rub or dress leather with dubbing; in *plastering*, to fill up with coarse stuff irregularities in the face of a wall, previous to finishing it off with plaster. In modern usage, to dub is to entitle or name with humorous reference to informal or popular appellations. DUB'BING, imp. DUBBED, pp. *dŭbd*. TO DUB CLOTH, to dress it with teasels. TO DUB A COCK, to prepare it for fighting by cutting off its comb and wattles. *Note.*—The principal part of the ceremony of dubbing a knight was investing him with the habiliments of his order, putting on arms, sword, and spurs—*tapping* with a sword was the finishing act.

DU BARRY, *dü bâr-rē'*, MARIE JEANNE GOMARD DE VAUBERNIER, Comtesse: favorite of Louis XV.: 1746, Aug. 19—1793, Dec. 7; b. Vaucouleurs. Her mother was a dressmaker, and her father, or reputed father, was an exciseman named Vaubernier. After the death of her father, she stayed for some time at a convent, but left it when 15 years of age; went to Paris, and assuming the name of Mademoiselle Lange, obtained employment in the establishment of a fashionable milliner; but in a short time renounced all honest occupation, and forming a connection with a disreputable house, met there the Comte Jean Du Barry, one of the most noted *roués* of his day, who made her his mistress. This person afterward introduced her to Lebel, valet-de-chamber of Louis XV., who presented her to his royal master, then nearly 60 years of age. She was at this time remarkably handsome, to some extent witty, and had a frankness, or it might be, a vulgarity of manner that amused the doting monarch. Desirous that *la petite Lange* should obtain a title, and be introduced to court, Louis prevailed upon Comte Guillaume Du Barry, brother of the comte already mentioned, to marry, and thereby confer his title upon, the favorite. Accordingly, in 1769, she was presented to court as the Comtesse Du Barry. After this period, many of the most powerful courtiers abased themselves before her. D'Aiguillon became her confidant, and in concert with her, ruled the doting king; the Chancellor Maupeou claimed a remote relationship with her, and by her influence succeeded in dismissing and exiling the parliament in 1771; the Abbé Terray, comptroller-gen. of finance, was *suave* to her, though insolent to all the rest of France. At no period, perhaps, was the court of France more openly and outrageously immoral than during the supremacy of this strumpet.

On the death of Louis, however, 1774, Du Barry was dismissed from court, and sent to live in a convent near Meaux. She was afterward removed to her residence of Luciennes, and while living there was allowed a pension by Louis XVI. Some time after the outbreak of the Revolution, she went to London to dispose of her jewels. On her return, Robespierre caused her to be arrested, 1793, July. In Nov., she was tried before the Revolutionary Tribunal, and accused of 'having wasted the treasures of the state, of conspiracy against the republic, and of having,

in London, worn mourning for the late king.' She was condemned to death, and was sent to the guillotine 1793, Dec. 7. Of all the women who mounted the scaffold during the Revolution, Du Barry exhibited the least courage. She implored the 'good people' to deliver her, and Monsieur the executioner to prolong her miserable life for one moment only. The single good thing that history records of her, is her patronage of various artists and men of letters, but there is little reason to believe that it originated in anything higher than her dread of epigram and caricature. She had neither taste nor knowledge, and cared only for sensual gratifications and excitement. It is estimated that she cost France 35,000,000 francs. The *Mémoires* published under her name (6 vols. Par. 1829–30) are not trustworthy; but Vatel's *Histoire de Mdlle. Du Bary* (3 vols., 1882–84), and Lacretelle's *Histoire de France pendant le 18me Siècle* may be consulted with confidence.

DUBBER, n. *dŭb'bẽr* [Hind. *dubbah*]: a leathern bottle or vessel, made of thin untanned goat-skins, and used in India to hold oil, ghee, etc.

DUBBING, n. *dŭb'bĭng* [Bohem. *dub*, oak-bark; *dubiti*, to tan (see DUB 2)]: a dressing of flour and water used by weavers; a mixture of tallow, etc., for dressing leather. DUBBING-TOOL, n. same as adze.

DUBHE, n. [Ar.]: a variable star of the first magnitude in the northern constellation Ursa Major.

DUBIOUS, a. *dū'bĭ-ŭs* [L. *dubĭŭs*, doubtful: It. *dubio:* L. *dubĭĕtas*, doubt]: not settled; doubtful; not clear or obvious; uncertain; in *OE.*, in two directions. DU'BIOUSLY, ad. *-lĭ*. DU'BIOUSNESS, n. DUBI'ETY, n. *-bī'ĕ-tĭ*, doubtfulness. DU'BITABLE, a. *-bĭ-tă-bl*, doubtful; uncertain. DU'BITABLY, ad. *-blĭ*.—SYN. of 'dubious': ambiguous; equivocal; questionable; precarious; doubting; unsettled; undetermined.

DUBITZA, *dô-bēt'sâ*, fortified town of European Turkey, on the n. frontier of Bosnia, on the right bank of the Unna, at a point about 10 m. from its confluence with the Save, of which it is a tributary. During the 16th and 17th c., it was a bone of contention between Austria and the Porte, and was repeatedly lost and regained by the latter. It is notable chiefly for its heroic but unavailing resistance to the Austrians 1788. Dubitza was subsequently restored to the Turks, but with the rest of Bosnia passed under Austrian administration 1878. Pop. 3,000.

DUBLIN, *dŭb'lĭn:* maritime county in the e. of Leinster Province, Ireland; containing the metropolis of that country; bounded, n., by Meath; e., by the Irish Sea; s., by Wicklow; and w., by Kildare and Meath. It is the smallest but two of the Irish counties; 32 m. long, and 18 (average 12) broad; 354 sq. m., of which $\frac{6}{7}$ths are arable, and $\frac{1}{40}$th in wood. The coast, from its indentations with creeks and bays, is 70 m. long, and off it lie several isles. Dublin Bay, one of the finest in the kingdom, is 6 m. broad, 6 long, with a sweep of 16 miles. It has two

precipitous hills, about 500 ft. high at its n. and s. ends; but the head of the bay is low and sandy. The coast is defended by 26 martello towers. The surface is mostly a level rich plain, with slight undulations, but rising in the south in a hill-range, the highest point of which is Kippure, 2,473 ft. North of this range, the only prominent eminences are Lambay Isle, or Ireland's Eye, and Howth Head, 503 ft. The only river of note is the Liffey, which runs through Dublin city into Dublin Bay. The Royal and Grand canals run w. through the county, and unite the Liffey and the Shannon. The chief rocks are carboniferous limestone, granite, and some metamorphic rocks and greenstone. There are copper and lead mines near Scalp. Fullers-earth and potters-clay occur. Iron and manganese are found on Howth peninsula. Granite and limestone are much used in building. There are many mineral springs, including 10 saline purgative ones, within the city of Dublin, and some tepid ones of 75° F. The climate is mild. The soil is generally a shallow calcareous gravelly clay. In the n. and w. are grazing and meadow farms, and around Dublin city, villas, kitchen-gardens, dairies, and nurseries. Dublin is the best cultivated county in Ireland. There are important fisheries along the coast, of turbot, brill, sole, plaice, cod, ling, haddock, whiting, and oysters. The manufactures (chiefly of cottons, stockings, and embroidered muslins) are mostly confined to the city and the vicinity of the metropolis, and are of more value than in any other Irish county. Balbriggan is famed for its hosiery. The chief exports are from Dublin city. Dublin is divided into 9 baronies and contains 76 civil parishes, and 10 parts of parishes. The chief towns are Dublin, the capital of Ireland, and Kingstown. The county sends 7 members to parliament, two for Dublin county, three for Dublin city, and two for Dublin University. The manners, appearance, dress, and cabins of the lower orders in Dublin county differ less from those of the interior of Ireland than would be expected. There are numerous antiquities in different parts of the county. Pop. (1901), exclusive of Dublin city, 157,568; including the city, 448,206.

DUB′LIN (Irish, *Dubh′-linn*, 'black pool;' the *Eblana* of Ptolemy): capital of Ireland: on the river Liffey, where it disembogues into Dublin Bay, lat. 53° 20′ 38″ n., and long. 5° 17′ 30″ w. It covers 1,300 acres, but its parliamentary boundary comprises an area of about 5,000 acres, and its municipal boundary nearly 4,000 acres. Much of Dublin is built on land reclaimed from the sea, a work which still continues; and the ground is generally flat, with few undulations, scarce deserving the name of hills. The river, running from w. to e., divides the city into two almost equal portions. The aristocratic parts are the s.e. and n.e. containing many beautiful squares, with splendid streets and terraces. The centre, and the n.w. quarter are the great emporiums of trade, and the residence of the middle classes, many of whom, however, have their private houses

in the suburbs. The s.w. division, part of which is called the 'Liberties,' once the seat of the silk trade, is the most filthy and degraded portion of the city. The streets in this quarter are narrow, crooked, and irregular. The city is surrounded by a 'Circular road' nearly 9 m. in length, forming a favorite drive and promenade.

In the newer parts of Dublin, the streets run at right angles to one another, and are remarkable for their breadth and the uniformity of their architecture, which, however, is so varied as to avoid monotony. The most imposing one is Sackville street, 120 ft. broad, and nearly 700 yards long; at its n. end stands the Rotunda, with Rutland square—in its centre, the beautiful Ionic portico of the general postoffice, and Nelson's monument (upward of 130 ft. high)—while on the s., it is terminated by Carlisle Bridge, and a wedge-like block of noble houses formed by the converging sides of Westmoreland and D'Olier streets. A peculiar feature of Dublin is its squares, which are very numerous, spacious, and well kept. Stephen's Green, the largest, occupies nearly 20 acres, and is about a mile in circuit. Somewhat smaller, but more elegant and aristocratic, is Merrion Square (13 acres). The large park and squares of Trinity College occupy more than 40 acres.

The public buildings of Dublin are famed for number and grandeur, and appear to more advantage since the dwelling-houses are built of brick. In the first class may be mentioned the Bank of Ireland (formerly the house of parliament), Trinity College, the custom-house, and the four courts, which, from the chasteness of their design, and the massiveness of their proportions, have a very imposing effect. The castle has no pretensions to architectural beauty. There are monuments of William III., in College Green (once a *green*, but now a paved street); of Nelson, the Duke of Wellington, Goldsmith, Burke, Grattan, and many others in various public sites. The benevolent and charitable institutions of Dublin are very numerous and liberally supported.

Within the limits of the circular road, the Liffey is crossed by nine bridges (two of iron), and through the whole extent of the city the banks of the river are faced with granite walls and parapets. On each side of these 'quays' there is a spacious roadway, with tall houses and excellent shops. The quay proper extends e. from Carlisle bridge. Near the custom-house, are several large docks for the accommodation of vessels from distant ports with excisable cargoes, and in communication with the Royal and Grand canals; the former connecting Dublin with the North Shannon and the w. of Ireland, the latter with the s. portion of the same river and the south. A very spacious dock, the 'Spencer dock,' was opened 1873; and the harbor has been much improved in late years by the completion of two large break-waters, the n. and s. walls. There is a bar at the mouth of the harbor, but even there the least depth at low tide is about 11 ft.

The chief manufacture of Dublin is porter, of which nearly 500,000 hhd. are annually exported, the Guinness

brand being the most widely known. Next in order is whisky, and then poplin. These, with some glass-works, cotton and linen factories, foundries, and the work-shops necessary to supply domestic wants, are the main branches of industry. In this regard, Dublin has been much more of a capital, and less of a manufacturing and export city than London. The direct foreign trade, though increasing, is very limited, Glasgow, Liverpool, and Bristol intercepting the greater portion of it. Much of the inland traffic is carried on by the canals above mentioned, and by the railways (now extending to all parts of Ireland), and consists principally of articles of dairy and farm produce from the central counties. The principal banks are the Bank of Ireland, the Royal, the National, Provincial, Hibernian, and Northern, with some private establishments.

The great educational institution of Dublin is Trinity College and University: see DUBLIN, UNIVERSITY OF. There is also a Rom. Cath. Univ., the medical school of which has been very successful. The Royal Univ. of Ireland, superseding in 1880 the Queen's Univ., is not a teaching body, but resembles the Univ. of London; it has its seat here. For the humbler classes, much has been done by the national board (whose model schools are attended by large numbers of children), by the Church Education Soc., the Christian Brothers, and Rom. Cath. brotherhoods and sisterhoods, and other agencies. There are many literary and scientific societies, dealing with subjects of general knowledge, or with matters of local or national interest. There are two botanic gardens—one at Glasnevin, belonging to the Royal Dublin Soc., and one near Donnybrook, connected with the university The hospitals, asylums, orphanages, and other charitable institutions are numerous, and liberally maintained.

The municipal affairs are under the control of a town-council, which consists of a lord mayor, 15 aldermen, and 45 councilors. The city police has charge of the surrounding country as far as eight m. from the castle. The city sends three members to parliament.

The environs of Dublin are especially beautiful. Rathmines, a southern suburb, has become a large township, and is the favorite residence of the wealthier part of the mercantile community. Glasnevin, on the north, deserves special notice as the favorite residence of the poet Tickell, of Addison, Steele, Parnell, Swift, Sheridan, and many other celebrated men. In the cemetery at Glasnevin lie the remains of Curran, O'Connell, and Tom Steele. The Phœnix Park is a magnificent area of nearly 2,000 acres, in some parts level, in others with broken ground, having a large extent of timber and brushwood, which shelter immense herds of deer. It affords ample scope for military reviews, and is extensively used by the inhabitants of Dublin of all classes for recreation. Dublin, as a whole, with its magnificent bay—which has often been compared to the Bay of Naples—splendid park, massive public buildings, wide streets, spacious and well-kept squares, clean and elegant

quays, and beautiful environs, is one of the most handsome and delightful capitals of Europe.

There are numerous places of worship, Rom. Cath. and Prot., monasteries, convents, friaries, and a Jewish syngogue. The most remarkable among the Protestant churches are St. Patrick's Cathedral, restored by the munificence of a single individual, and Christ Church, which also has undergone restoration; and among the Rom. Cath. St. Mary's, St. Saviour's, St. Augustine's, St. Kivin's.

Dublin was taken by the Danes in the 9th c., and was practically held by them till the English conquest. James II. held a parliament there in 1689, and William III. occupied it immediately afterwards.

Pop. of municipal borough (1871) 246,326; of whom 195,180 were Rom. Cath., 39,897 Episc., 4,517 Presb., and the rest of other denominations; pop. of parl. bor., 267,717. Pop. of city (1881) 249,602; with suburbs of Rathmines, Glasnevin, New Kilmainham, etc. (1901) 290,638, and about 390,000 in metropolitan police district.

DUBLIN, UNIVERSITY OF: successor of the first university of Dublin, which was established in connection with St. Patrick's Cathedral 1320; but which for want of proper endowments, never prospered, and dragged out a miserable existence till, probably, the dissolution of the cathedral by Henry VIII. The existing univ. was founded 1591–2, and is a college with university powers. Trinity College, indeed, was intended merely as a *nucleus* of a univ., but as no colleges have been added, it remains in undisputed possession of all university privileges. Queen Elizabeth provided the charter, the corporation of Dublin bestowed the ground and ruins of the suppressed monastery of All-Hallows, and the Irish gentry supplied by subscription the funds necessary for the erection of the buildings. The income of the college was very limited and very precarious, till James I. endowed it with certain estates in the province of Ulster, and a yearly pension of £388, 15*s.*, English money, from the public purse. By Queen Elizabeth's charter, the corporation was to consist of a provost, three fellows, and three scholars, in the name of more, with the power of purchasing, taking, and possessing any manors, tenements, etc., from the sovereign, or from any other person. On a vacancy in the provostship, the fellows were entitled to elect a fit successor, and the election of fellows and scholars lay with the provost and fellows. The provost and fellows had full powers to enact statutes, confer degrees, and prescribe the necessary exercises for graduation, and to do all the work of tuition. Defects soon began to show themselves in this constitution, but they were remedied by the new statutes of Abp. Laud, definitely published 1637, and in the main still in force. By these the election of provost was given to the crown.

In 1613, James I. conferred on the univ. the right of sending two members to the Irish parliament. One of these was taken away at the Union, 1800, but was restored by the Reform Bill of 1832. The electors were formerly

the provost, fellows, and scholars; but, in 1832, the privilege was extended to masters of arts, and those of higher degree.

To proceed to the degree of A.B., a student must keep terms for four years, two terms at least being necessary in each year. Terms may be kept either by residence, and attendance on lectures, or by simply appearing on a stated day in the public hall, and passing a creditable examination in a prescribed course. Lectures are delivered on the different subjects of each term examination by the tutors, the honor examiners, and the university professors. Students of the first year are called junior freshmen; those of the second, senior freshmen; of the third, junior sophisters; and of the fourth, senior sophisters. All students must pursue the following course: *first year*, Latin, Greek, mathematics; *second year*, Latin, Greek, mathematics, logic, and metaphysics; *third year*, Latin, Greek, physics, logic, and metaphysics; *fourth year*, Latin, Greek, physics (both mathematical and experimental), astronomy, and ethics. For those who aspire to honors, the course is much more extensive than that for mere *pass*. Term examinations having been duly passed, the student is promoted to the degree A.B. Those students who, at the final ordeal of the fourth year, stand highest in an examination over an extra course, are called (according to merit) senior or junior moderators. These form the first class of graduates, the second being called respondents. The third consists of 'unclassed candidates.' The higher degrees are procurable after the lapse of a fixed number of years, and on the performance of certain exercises, and the payment of fees.

Connected with Trinity College are schools for medicine and engineering. The Divinity School of the Church of Ireland is also in connection with the university. Graduates in medicine and in engineering must previously graduate in arts. The divinity testimonium is obtained after two years' attendance on lectures, with an examination at the end of each term.

In 1859, 14 studentships were founded, worth £100 a year each, tenable for seven years, to encourage graduates in the pursuit of some special branch of study which they may afterward be called on to teach, should they become fellows and lecturers. Two are given every year, and (like every other prize or distinction in the university, not connected with the divinity school) are open to persons of all religious denominations. They are awarded to those candidates at the Degree examination who take the highest places in science and classics respectively.

The univ. is well equipped for carrying education to a high degree of perfection. The teaching staff is numerous, and in the actual work of tuition, the tutorial and professorial elements are more largely combined than in any other British university. Among the many distinguished men who have gone forth from her halls, are Ussher and Berkeley, Elrington, Lloyd, Magee, Sir W.

Hamilton, Romney Robinson, Maccullagh, Archer Butler, Lord Cairns, Burke, Sheridan, Curran, Swift, and Goldsmith.

DU BOIS: borough, Clearfield Co., Penn., on Allegheny valley and Buffalo and Rochester and Pittsburgh rrs., 127 m. e.n.e. from Pittsburgh; a centre for coal-mining and lumbering; has banks, daily and weekly newspapers, good schools, etc. Pop. (1910) 12,623.

DUBOIS, *dü-bwâ'*, GUILLAUME, Cardinal: 1656, Sept. 6—1723, Aug. 10; b. Brives-la-Gaillarde, Auvergne, where his father was an apothecary. At the age of twelve, he came to Paris, and entered the college of Saint Michel, as a domestic of the principal. Here he made such good use of his opportunities for acquiring knowledge, that he was selected as tutor to the son of a merchant named Mauroy, and gradually rose till he was tutor to the young Duc de Chartres. Although of an ugly exterior, he contrived, by his mixture of wit and hypocrisy, to win the esteem of the boy's mother, while he gained the unlimited confidence of his pupil, partly through their common love of letters, and partly because he took upon himself the odious office of pander to his vices. His public career commenced after the marriage of his pupil, 1692, with Mademoiselle Blois, a natural but legitimatized daughter of Louis XIV. He then received from that monarch, for his services in bringing about the match, a gift of the abbey of St. Just, in Picardy. He was next attached to the French embassy at the court of London, where he formed important political connections. On his return, he became private sec. to his old pupil; and when the latter (now Duke of Orleans) became regent 1715, Dubois became virtually the most powerful man in France. The great act of his life was the famous treaty signed at La Haye 1717, Jan. 14, known as the *triple alliance*, between England, Holland, and France. The importance of this act was in its effectual change of the foreign policy of France, in spite of the French princes, in spite of the traditions of Louis XIV., in spite of the dislike of the English king for the Regent, and finally, in spite of Cardinal Alberoni himself, the Spanish minister. In reward for his brilliant dexterity, Dubois received the office of minister of foreign affairs, and in 1720, on the solicitation of George I. of England, was appointed to the vacant archbishopric of Cambray. In 1721, he obtained the cardinal's hat, and in the following year became prime-minister of France, when his authority seemed unbounded. He died a victim to hard work and the wildest debauchery.

DUBOIS, JOHN: 1764, Aug. 24—1842, Dec. 20: b. Paris: Rom. Cath. bp. He was educated in the College of Louis le Grand and the Oratorian Seminary of St. Magloire, ordained by special dispensation 1787, Sept. 22, and appointed asst. rector of St. Sulpice parish and chaplain of the Hospice des Petites Maisons. At the beginning of the French Revolution he fled to the United States, and landed at Norfolk, Va., 1791, Aug., where he was cordially

received by Bp. Carroll and others to whom he presented letters from Lafayette. For several years he had charge of Rom. Cath. parishes in Md. and Va., and frequently held religious services in the state capital, Richmond. He founded the college and church of Mt. St. Mary, at Emmettsburg, Md., 1805, was pres. of the former till 1826, and was then appointed bp. of the diocese of N. Y., which included at that time a part of N. J. He erected churches in Albany and Buffalo, a college at Nyack, and St. Vincent de Paul's Seminary at Lafargeville, and when refused the necessary funds for the erection of various religious institutions by his own parishioners, went to Europe and collected a large sum of money for the purpose. He was given a coadjutor 1838, at which time his health began to fail.

DUBOIS-REYMOND, *dū-bwâ′rā-mōng′*, Emil Heinrich: b. Berlin, 1818, Nov. 7: physiologist. He was educated in the universities of Bonn and Berlin, began studying geology as a specialty, but soon gave it up to apply himself to anatomy and physiology. In 1843 he published the first fruit of his studies of animal electricity, *A Treatise upon the so-called 'Froschstrom' and the Electro-motive Fishes.* In 1851 he was elected a member of the Berlin Acad. of Sciences, and 1867 its perpetual sec.; and 1858 succeeded his teacher, Johannes Müller, as prof. of physiology in the Univ. of Berlin. He has long been esteemed one of the most noted workers in what is known as the physical dept. of physiology. His publications include *Collected Essays upon General Muscular and Nervous Physics* (1875–77), *Darwin vs. Galiani* (1876), *Physiological Inquiries* (1878), *History of Civilization and the Natural Sciences* (1878). He also revised Sach's *Inquiry Concerning the Electrical Eel* (1881), *Speeches* (1886–7). Between 1859 and '77 he edited *Archives of Anatomy and Physiology,* a periodical established by Prof. Müller, and since 1877 has conducted it under the title of *Archives of Physiology.*

DUBOVKA, *dô-bov′kâ:* town of European Russia, govt. of Saratov, on the e. slope of the Sarpa Hills, on the right bank of the Volga; lat. about 49° n., and long. 44° 45′ e. It is a dépôt for goods brought from the n. provinces, which it forwards to Katschalinskala, a town about 40 m. distant on the Don. The produce is thence conveyed on the Don to the s. provinces. Dubovka has some trade in wood, oil, iron, and manufactured articles. Pop. 16,370.

DUBUQUE, *dô-būk′:* city, county seat of Dubuque co., Iowa, on the w. bank of the Mississippi river; 200 m. w. of Chicago, 250 s. of St. Paul, and 350 n. of St. Louis. Its superior railroad connections and river communication with St. Paul and St. Louis makes Dubuque an excellent manufacturing and shipping point, and has always kept the city in the forefront of growth and prosperity. It is the oldest and largest city in the state except the capital; a port of entry and has an area of 13 sq. m. It was founded

in 1778 by Julien Dubuque, a French lead-miner, who secured a large concession from the Indians and the Spanish authorities, for the purpose of developing its lead mines. These were abandoned at the time of his death in 1810; and the place was permanently settled in 1833, beginning June 1, at which date the Indian title was extinguished by the Black Hawk treaty. Before the close of the year, 500 people were residing here, a school house built and occupied, and Milo H. Prentice appointed postmaster. The first church building (log and Methodist) erected in Iowa was here, in 1834. The first printing office was also established here 1836, May 11, by Judge John King at 'Dubuque Lead Mines, Wisconsin Territory,' named *The Dubuque Visitor*. Dubuque is one of the richest lead regions in the U. S., and the shipping point for the mines of Iowa, Wis., and Ill.

Industries.—In 1905 Dubuque reported 156 manufacturing plants, with a capital of $10,000,000, employing 5,000 persons, with a yearly pay-roll of $2,500,000, and an output of $10,000,000. The principal manufactures were white lead, shot, steam engines, agricultural implements, wooden wares, brick, leather, artificial stone, sash, doors, and blinds, beer, flour, soap, and candles. It has a handsome marble custom-house, an attractive city hall, three national banks, cap. $700,000, five state banks, cap. $750.-000, and five daily, nine weekly, and three monthly papers, with a good street-railway system. Its educational institutions comprise 18 public schools, a German Presb. Theol. School, a Prot. Episc. Seminary, four Rom. Cath. seminaries, several convents, and the Iowa Institute of Arts and Sciences. It is the seat of the Roman Catholic bishop, and besides an imposing cathedral has 34 churches, 27 Protestant, seven Roman Catholic. Dubuque has two public parks, is lighted with gas and electricity, is supplied with water by a costly system of water-works and artesian wells, has a liberally maintained public school system, and in addition to its other industries, has a large grain trade. It also has a complete ship-building plant in which considerable work has been done for the new navy. Slaughtering and meat packing has become an important industry. Population, (1900) 36,297; (1910) 38,494.

DUCAL, a. *dū'kăl* [F. *ducal;* It. *ducale*, pertaining to a duke: F. *duc*, a duke—from L. *dūcō*, I lead; *dux*, a leader]: pertaining to a duke. DUCAT, n. *dŭk'ăt* [OF. *ducat*—from It. *ducato*]: coin first struck by a duke; one of the most extensively used names for a coin, mostly of gold. Ducats were first coined in the 12th c. in Sicily, and took their name from the legend found on those early Sicilian pieces *Sit tibi, Christe, datus, quem tu regis, iste Ducatus* (*ducatus* means duchy). Such coins were extensively issued after the 12th c. in Italy, especially at Venice. Venice ducats were called *Zecchini* from *Zecca*, where the mint was situated. The ducat was adopted 1559 by the imperial diet of Germany into the currency of the empire, and was afterward coined in the several German states, and over the whole of

northern Europe, Russia included. The coins generally bore the likeness of the sovereign princes. The ducat varied in weight and fineness; by far the most common which was current in Austria, Russia, Hamburg, etc., weighed 54 troy grains, sterling value about 9*s.* 4*d.* (abt. $2.20). The modern Italian ducat was of much less value. The gold ducat of Venice was valued at 6*s.* In the (late) kingdom of the two Sicilies, the ducat (ducato del regno) was a silver coin and money of account, forming the unit of the currency, being divided into 100 grani, in the island of Sicily into 100 bajocchi. There are few silver ducats, however, in existence. This ducat = 3*s.* 4*d.* sterling. There are various kinds of the Spanish *Ducado*, generally translated dollar. The ducado de plata, or silver ducat, is worth $1.05. The ducat is now, to a great extent, merely a money of exchange. Duc'atoon, n. *-tôn*, a coin which varied in value from about $1 to $1.37.

DUCANGE: see Dufresne, Charles.

DUCAS, *dŭ'kas*, Michael, Greek historian who flourished under Constantine XII., abt. 1450: dates of birth and death unknown. He was a descendant of the family of the emperor Michael VII. After the fall of Constantinople and its occupation by Mohammed II., he was employed in various diplomatic missions by the princes of Lesbos, where he had taken refuge. He remained there till the island was again united to the Turkish Empire, when he went to Italy, as is believed, and wrote the history for which he is remembered. It contained an outline of universal chronology and a history of events extending from the reign of John Palæologus I. to the capture of Lesbos, 1462.

DUCAT, etc.: see under DUCAL.

DUCATO, *dô-kâ'tô*, Cape (anciently, *Leukatē*); headland at the s. extremity of a promontory of Santa Maura, one of the Ionian Islands; lat. 38° 34′ n., and long. 20° 32′ e. Cape Ducato was in ancient times dreaded by mariners, and the modern Greek sailor still fears the strong currents and the fierce gales which he has to encounter there. A point on the w. side of the *Leucatian* promontory is called *Sappho's Leap*, as it was supposed that here the poetess precipitated herself into the sea. It is a white broken cliff, rising perpendicularly from the water to the height of about 2,000 ft. On its summit stood a temple dedicated to Apollo, the substructure of which still exists.

DUCES TECUM, phrase, *dū'sēz tē'kŭm* [L. you shall bring with you]: in *law*, a writ commanding any person to attend in a court of law, and bring with him all documents, writings, or evidences required in a suit.

DUCEY, Thomas James: 1843, Feb. 4————; Rom. Cath. priest: b. Lismore, Ireland. He came to the U. S. in childhood; entered St. Francis Xavier Coll., New York, 1860; studied theol. and was ordained priest 1868. While asst. priest of a New York parish, Ducey in his sermons denounced the scandals of the municipal govt., and incurred the enmity of the 'ring,' who sought to have him

assigned to a charge outside the city. He was active in founding 'lyceums' for young men 1872–80; then erected a church and organized a parish. In nearly every movement for the reform of municipal politics he has taken part. In the controversy between Dr. Edward McGlynn and Abp. Corrigan, which resulted in the excommunication of McGlynn, Ducey on many public occasions expressed sympathy with the opinions and conduct of the recalcitrant priest. In 1891 the Pope conferred on him the title of Monsignore. He has been an active champion of labor and reform. In 1894 his sympathy with the reform movement of Dr. Parkhurst led to his attendance on the sittings of the Lexow committee, so frequently as to lead to an order from Abp. Corrigan forbidding his appearance at these sessions, which he refused to obey.

DU CHAILLU, *dü shâ-yü'*, Paul Belloni: b. Paris, 1835, July 31; d. St. Petersburg, 1903, April 30. His father was for many years a merchant trading on the Gaboon (q.v.) river in w. Africa, and thither Paul was carried when a boy. He lived there for several years, and became familiar with the habits and languages of the natives, thus—as well as in his habituation to the climate—unconsciously preparing himself for the explorations which he was afterward to undertake. In 1842, the French made a settlement and built a fort on the Gaboon. Under the protection of this fort, both the elder and younger Du Chaillu resided and carried on their commercial pursuits for some years. Du Chaillu afterward went to America, where he resided for a number of years, and was naturalized in New York. In 1855, Oct., he sailed from New York to w. Africa, where he spent four years in explorations, travelling, as he himself tells us, about 8,000 m., always on foot and unaccompanied by other white men. He returned to America, and after subjecting his specimens in natural history and ethnological notes to the examination of the scientific men of New York and Boston, he went to England and published a volume of travels—*Explorations and Adventures in Equatorial Africa, with Accounts of the Manners and Customs of the People, and of the Chase of the Gorilla, Crocodile, Leopard, Elephant, and other Animals* (Lond. 1861). His travels were in a region lying between n. lat. 1° 30′, and s. lat. 2°, and extending from the coast to about e. long. 14° 15′; and the work in which he gives an account of them contains very important contributions to geographical, ethnological, and zoological science. Under the first of these heads must be ranked, as of chief importance, the information concerning the Fernand Vas, Ogobai, and Rembo Rivers (see Ogobai, or Ogowé), and concerning the mountain chain which, between the equator and s. lat. 1°, stretches from w. to e. from the neighborhood of the coast far into the interior of Africa. He made known the existence and described the characteristics and habits of a number of African tribes, among which particular interest attached to his account of the Fans (q.v.), a cannibal tribe, inhabiting

a region on the w. side of the coast range of mountains, a little n. of the equator. His contributions to zoology included not only the gorilla and other remarkable apes, some of them previously unknown, but also many new species of mammals and birds. Many of the statements contained in his volume, however, being very extraordinary, it was received with much distrust and was subjected to very adverse criticism; to which it was the more exposed because the author's journals having been put into the hands of a literary gentleman in the United States to be prepared for the press, separate journeys were mixed up in the narrative, and the chronology was thrown into confusion. Much discussion took place in newspapers and periodicals, and some writers went so far as to assert their belief that Du Chaillu's stories about the gorilla were entirely fabulous, and that he had never seen the animal alive, but had purchased from natives on the coast the specimens which he brought to England. His descriptions of nest-building apes also were received with incredulity, and the truth of his account of the cannibal Fans was much doubted. The maps drawn up by Dr. Barth and Dr. Petermann in 1862 moved the positions of all the places which he had visited much nearer the coast than he had stated them, so as greatly to reduce the length of his routes. The general trustworthiness of Du Chaillu's narrative was, however, maintained by some men of the highest eminence, particularly by Sir Roderick Murchison and Dr. Owen. Du Chaillu resolved to confute his opponents, and vindicate his own reputation, by another expedition to Africa, for which he prepared himself by a course of scientific study, to enable him to make astronomical and other observations and by acquiring the art of photography. During his first explorations he had laid down the position of places from compass-bearings only. The substantial accuracy of his observations was, however, in the meantime confirmed by a French government expedition under Messrs. Serval and Griffon du Bellay, which explored the Ogobai river 1862; and Dr. Petermann then reconstructed his map of that part of Africa as Du Chaillu had originally laid it down. His statements also regarding the cannibalism of the Fans were confirmed by Capt. Burton, who himself travelled among them. Du Chaillu, however, proceeded on his second expedition. He freighted a small schooner, and sailed in her from England 1863, Aug. 6, carrying with him not only an ample store of scientific apparatus, but also of goods for presents to the natives, or barter with them. He reached the mouth of the Fernand Vas river Oct. 10, and was warmly welcomed by the African chiefs whom he had formerly known; but he sustained a grievous misfortune in the loss of all his scientific instruments and many other valuable articles, through the swamping of the canoe by the surf as they were being landed from the schooner. He was compelled to send to England for another set of instruments, and to wait till they arrived. Meanwhile, he made several excursions in the

neighborhood of the coast, through the almost impenetrable jungle which covers the w. coast regions of equatorial Africa, and had abundant opportunity of confirming his former observations regarding the gorilla. He also had live ones caught and brought to him by the natives. In 1864, Sept., Du Chaillu having received his new supply of instruments from England, started on his expedition for the exploration of the interior. He was attended by a body-guard of ten Commi negroes, in thick canvas trousers, blue woolen shirts and worsted caps, each man having a blanket to keep him warm at night. There was difficulty, however, in getting leave to set out on the expedition at all. It is the universal rule among the coast tribes of w. Africa to prevent, if possible, all strangers from penetrating into the interior, even if it only be to the next tribe, through fear that the exclusive privilege of trading with that tribe should be lost. A grand *palaver* was held on the subject, and it was at last agreed that Du Chaillu should be allowed, as a special favor, to ascend the Fernand Vas or Ogobai, as his object was not to trade, but to shoot animals, and to bring away the skins and bones. 'Truly,' the chiefs and councilors said, 'we do not know what Chaillie has in his stomach to want such things, but we must let him-go.' Du Chaillu revisited some of the scenes of his former explorations—the Ogobai, the Rembo, and their branches. He suffered great hardships, being sometimes at a loss for food, and his attendants being almost all at one time ill of small-pox, which made fearful havoc among the native population, and exposed him to the dangerous suspicion of having caused it by witchcraft. He found scenes of extreme beauty, scenes of mountain and meadow, hill and pasture-land, groves of plantains, groves of lime-trees remarkable for dark foliage, stately palms, and clear sparkling streams. An unfortunate misunderstanding took place at last between Du Chaillu's party and the inhabitants of a village which he had reached. A conflict took place, the natives became exasperated, and it was with difficulty that the traveller escaped, being obliged, however, to resign all thought of proceeding farther. He reached the mouth of the Fernand Vas river 1865, Sept. 21, and found a vessel there loading for London. He had lost everything but his journals; all the treasures in natural history which he had collected were gone. He brought home, however, his astronomical observations, which have been carefully examined by the most competent persons and the map of w. equatorial Africa has been made much more complete and correct than before. Du Chaillu did not penetrate, on any of his journeys, much more than 240 m. in a direct line from the coast, but his discoveries have been numerous and important, and among them are about 80 new species of mammals and birds. No one now doubts the right of Du Chaillu to be ranked among the most enterprising and truthful of travellers. The account of his second expedition to Africa is entitled *A Journey to Ashango-Land* (Lond. 1867). His ethnograph-

ical observations were published in *My Apingi Kingdom* (1870), and *The Country of the Dwarfs* (1872). He published the *Land of the Midnight Sun* (1881), and *The Viking Age* (1887). In 1901 he left the U. S. for a three years' tour of the interior of Russia, and died in St. Petersburg.

DU CHÂTELET: see CHÂTELET-LOMOND.

DUCHÉ, *du-shā'*, JACOB, D.D.: 1737–1798, Jan. 3; b. Philadelphia: first chaplain of the continental congress. He graduated at the Univ. of Penn. 1757, and after studying at Cambridge Univ., England, received from the Anglican bp. of London a license to officiate in the churches of Philadelphia. He opened the session of the first congress, 1774, Sept. 7, with such fervent and patriotic invocations that he was officially thanked. In 1775 he became rector of Christ Church, Philadelphia; 1776, July, was again chosen chaplain of congress. In 1777 he urged Washington to abandon the patriot cause in a letter which was sent to congress and afterward published. For this action his property was confiscated, he was declared a traitor, and compelled to leave the country. Returning to England he became chaplain to the Lambeth orphan asylum, but resumed his residence in Philadelphia 1790.

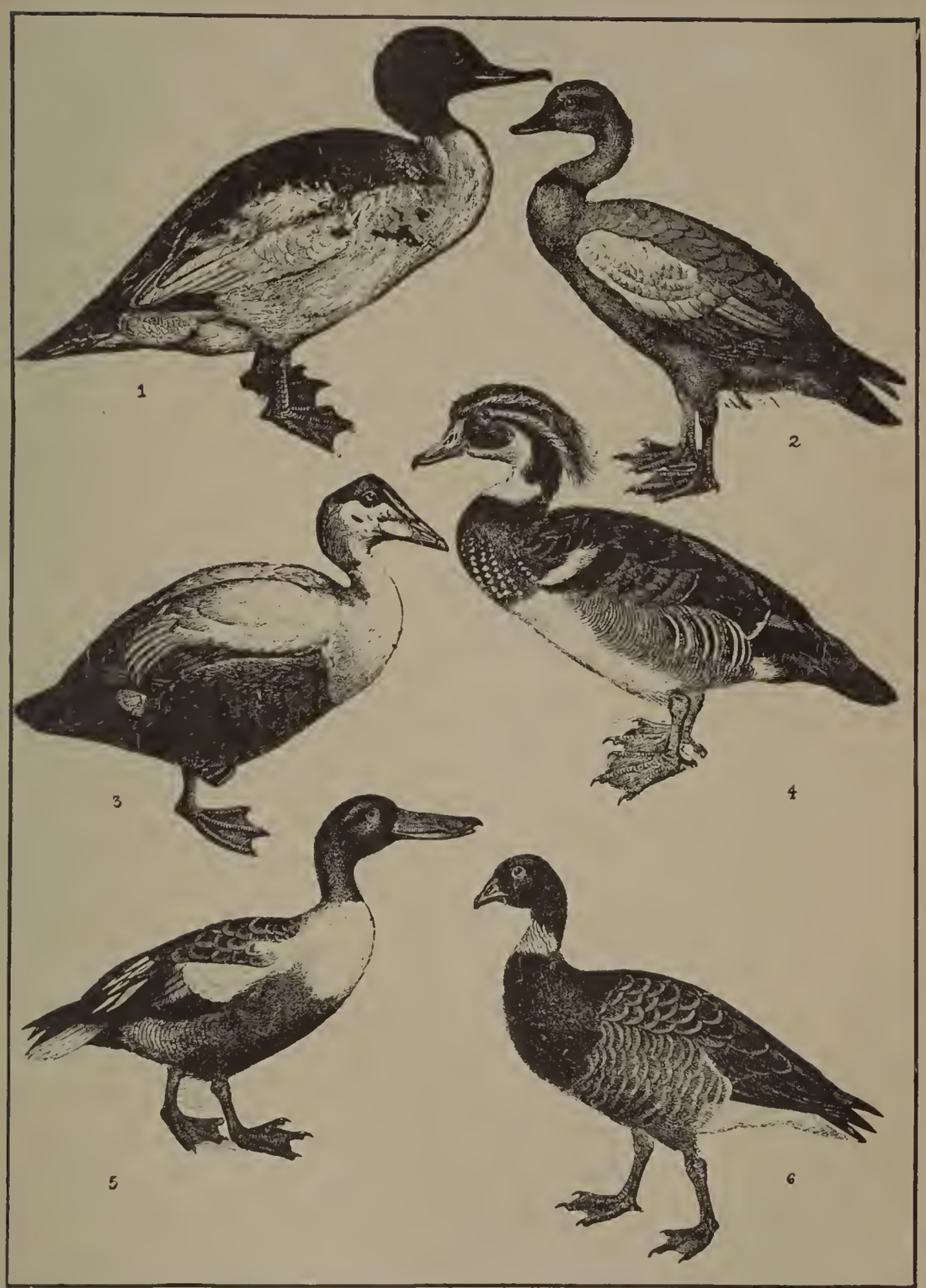
DUCHESNE, *dü-shān'*, ANDRÉ (in Latin, Andreas Chesnius, or Duchenius, or Quercetanus): father of French history: 1584, May—1640, May 30; b. at Ile-Bouchard, in the old province of Touraine. He studied at Loudun and Paris. History and geography were his favorite studies, and under Richelieu's ministry he was appointed royal geographer and historiographer. He died from being crushed against a wall by a carriage in a narrow street. His collection of the *Historiæ Francorum Scriptores Coætanei ab ipsius gentis origine ad Philippi IV, tempora* (5 vols., Paris, 1636–49), is particularly important. It was continued from the third vol. by his son, François Duchesne (1616–93, also historiographer), and contains much that may be sought in vain in Bouquet's collection. Of his numerous writings, specially notable are *Historiæ Normannorum Scriptores Antiqui* (Paris 1619); *Histoire Généalogique de la Maison de Montmorency et de Laval* (Paris 1624); and *Histoire Généalogique de la Maison de Vergi* (Paris 1625). The last two throw much light upon the history of France. Duchesne's industry was extraordinary; he is said to have left more than a hundred folios in manuscript.

DUCHESS, and DUCHY: see under DUKE.

DUCHESS, n.: in *build.*, a roofing slate, in size 24 inches by 16.

DUCHOBORT'ZI: Russian religious sect, of the origin of which nothing is certainly known, and which, though conjecturally referred by Count Krasinski to the Patarenes (see CATHARI), cannot be traced beyond the middle of the 18th c., when it was found in different parts of Russia; and its members became exposed to penalties by their refusal

REPRESENTATIVE DUCKS AND GEESE.



1. Goosander (*Mergus Merganser*).
2. Brahminy Duck (*Tadorna casarca*).
3. Elder (*Somateria mollissima*).
4. Wood Duck (*Aix sponsa*).
5. Shoveler (*Anas Clypeata*).
6. Bernicle Goose (*Branta bernicla*).

to serve in the army. The Duchobortzi hold the doctrine of the Trinity, and are distinguished chiefly by their holding that human souls existed before the creation of the world, and fell in that former existence, from which the fall of Adam and a continual tendency to fall have proceeded; also by their ascribing hidden meanings to all parts of the Bible, for the knowledge of which they depend on inward light. They are extreme mystics. They reject the use of pictures common in the Russian Greek Church. They observe neither baptism nor the Lord's Supper. In their religious meetings they salute each other with bows and kisses; they pray, sing psalms, and exhort or expound the Scriptures. They are, however, generally very ignorant. On the accession of the Emperor Alexander I., they received complete toleration, and were allowed to settle by themselves on the bank of the Molochna in s. Russia. Here, however, an impostor named Kapustin prevailed on them to receive him as a prophet, taught them the transmigration of souls, and made them believe that he himself was animated by the soul of Jesus Christ; and it appears that, in consequence of disputes arising among them concerning him, great numbers were buried alive, and otherwise put to death by the rest, on which the settlements on the Molochna were broken up 1841, and great part of the people transferred to the provinces beyond the Causacus.

DUCK, n. *dŭk* [Dut. *duycken*, to bow the head, to sink it under water: Dan. *dukke*, to duck, to plunge: Sw. *dyka*, to dive: Bav. *ducken*, to press down]: a well-known waterfowl, the male of which is called a *drake*—which see; a quick inclination of the head, resembling the motion of a duck's head in water; a game in which a small stone, placed on a larger, is to be hit off by the player throwing similar stones at a short distance: V. to plunge or dip in water, and then withdraw, as the head; to bob the head down; to stoop; to bow. DUCK'ING, imp.: N. immersion in water. DUCKED, pp. *dŭkt*. DUCK'LING, n. a young duck. DUCK'ER, n. one who, or that which. DUCK-ANT, n. in *zool.*, a species of termites, or white ant, a native of Jamaica. The duck-ants nestle in clusters on trees. DUCK-HAWK, n. in *ornith.*, the moor buzzard. DUCK-MOLE n.: same as DUCK-BILL. TO MAKE DUCKS AND DRAKES, to throw a stone obliquely on the water so as to strike it, and rebound repeatedly; to squander money as heedlessly as children throwing stones along the surface of water. DUCKING-STOOL, a mode of punishment for scolding women, who were placed on a stool, and then let down into the water—some write CUCKING-STOOL, but that appears to have been the name of a different though similar apparatus. DUCK'WEED, a native water-plant floating on the surface of fresh-water lakes and ponds; the various species of *Lemna*, ord. *Arācĕæ*—said to be only a corruption of *dikeweed* or *ditch-weed*. DUCK-LEGGED, *-lĕgd*, short-legged. DUCK'S-BILL BIT, a wood-boring tool adapted to be used in a brace. It has no lip, but the screw-cylinder, which forms the barrel

of the tool, terminates in a rounded portion whose edge is to form the cutter. DUCK'S-BILL LIMPET, in *zool.*, *Parmophorus*, a genus of gasteropods belonging to the family *Fissurellidæ* (q.v.); large compared with its shell, which is oblong. DUCK'S-FOOT, n., in *bot.*, *Alchemilla vulgaris*, from the shape of the leaf; *Podophyllum*, a genus of ranunculaceous plants. DUCK'S-FOOT PROPELLER, a collapsing and expanding propeller which offers but little resistance in the non-effective motion, but expands to its full breadth in delivering the effective stroke, forming a kind of folding oar, which opens to act against the water when pushed outward, and closes when drawn back at the end of the stroke. The idea was taken from the foot of a duck, and was first tried by Bernoulli, afterward by Genevois, a Swiss clergyman, about 1757; then by Earl Stanhope about 1803. It was used on the river Thames about 1830. TO DUCK UP, in *naut.*, to clear or haul a sail out of any position which interferes with the helms-man's view.

DUCK, n. *dŭk* [Dan. *dukke;* Sw. *docka*, a doll, a baby: M.H.G. *tocke*, a doll, a term of endearment to a girl]: a pet; a darling: see DOXY.

DUCK, n. *dŭk* [Dut. *doek*, linen cloth, canvas: Sw. *duk;* Ger. *tuch;* Icel. *dukr*, cloth]: a kind of plain linen of a coarse heavy make, a canvas highly glazed, used for smock-frocks by English agricultural laborers, and for working-dresses by those employed at smelting furnaces and iron forges; a finer duck is sometimes used for coats, vests, etc.

DUCK: name of a well-known group of water fowl: see ANAS. The broader bill, laminated and not toothed, distinguishes the Linnæan genus *Anas* from *Mergus* (including Smews, Mergansers, and the Goosander). In recent ornithological systems, however, it is divided into numerous genera; but three chief groups are usually recognized, corresponding to swans, geese, and ducks of popular nomenclature: see GOOSE: SWAN. The group to which the name duck is sometimes extended, both by scientific writers and in popular language, is characterized by greater breadth of bill than either the swans or geese. Their food is chiefly animal, while that of both swans and geese is in great part vegetable. Their legs are shorter and placed further backward than those of geese, so that they move with greater difficulty and with a more waddling gait on land, and their necks are shorter than those of geese, and much shorter than those of swans, though in this character there is a considerable difference between different species. There is a very marked difference in plumage between the males and females, which is not the case in any corresponding degree in swans and geese. They exhibit also a peculiar anatomical character in a large dilation of their trachea (windpipe) on each side at its bifurcation. This great group of ducks is subdivided into two sections; one section characterized by a webbed or broadly margined hind-toe, the other by a hind-toe destitute of membrane. These characters are connected with important differences in

other respects, and particularly in habits; the ducks of the first section being chiefly oceanic, living more exclusively on animal food, and diving readily and frequently in pursuit of it; while those of the second section are more generally inhabitants of lakes and other inland waters, showing a preference for shallow waters. Those of the first section also have the feet placed further backward than those of the second; those of the second have generally longer wings than those of the first, and a longer neck by which they are adapted for seeking their food by dabbling in muddy shallows, they less frequently dive, and when alarmed generally seek safety by taking wing. Many of both sections are migratory, and spend the summer in arctic and subarctic regions. Not a few of them are common to the n. parts of both the e. and w. continents. Their plumage is remarkably thick, soft, and compact. The tongue, which, unlike that of most birds, is large and fleshy, assists in the selection of food. To the first or oceanic section of ducks belong Scoters, Garrots, Eiders, Pochards, Scaups, Harelds, etc.; to the second section belong Shieldrakes, Shovellers, Musk Ducks, Summer Duck, Pintails, Gadwalls, Teals, Widgeons, Bluewings, etc.—See these titles.

The Common Duck, or Domestic Duck (*Anas boschas*), known also in its wild state as the Wild Duck or Mallard, belongs to a genus, or sub-genus, of the second section, characterized by a flattish broad bill, longer than the head, not contracted, nor much dilated, toward the tip, and not much elevated at the base, destitute of a tubercle at the base, the denticulations of the upper mandible (ends of the laminæ) scarcely projecting beyond the margin, and a short and rather pointed tail of 16 feathers. Even as thus characterized, it includes Teals (q.v.) which are by some ornithologists constituted into a separate genus. The male (drake, q.v.) of the common duck has the four middle tail-feathers recurved. The deep emerald green of the head and upper part of the neck, the white collar which separates the green from the dark chestnut of the lower part of the neck, and the deep blue iridescent *speculum* of the wing —formed by the outer portion of the outer web of the secondaries—also are marked characteristics of this beautiful bird; the plumage of which exhibits greater brightness of colors—during the breeding season at least—in the wild than in the domestic variety. At the close of the breeding season, the male of the wild-duck assumes for a time a plumage more sober, and resembling that of the female; but before winter, the splendid plumage proper to his sex is again acquired. The mallard or wild-duck is widely distributed, being found in the n. parts of Europe, Asia, and America, and extending s. as far as Florida—where it is abundant—and the W. Indies, though in the Old World it is not known as belonging to regions of similar climate. It was formerly much more abundant than now in Britain, the drainage of marshes having apparently tended more than any other cause to the diminution of its numbers. Multitudes of mallards, however, still visit the fen counties

of England in winter; and great numbers are taken in decoys, with other *Anatidæ*, and sent to the London market. See WILDFOWL. Many wild-ducks, however, still breed in Britain, sometimes near the lakes or rivers which they frequent, sometimes in more elevated moorish districts, from which the parents often take opportunity of bringing their very young brood to the lower waters, by swimming down the streams on some occasion of their being swollen by rain, and it is interesting to see the little creatures hurried on, without injury, by the current, and passing along narrow rapids and over waterfalls of considerable height, much as pieces of cork might do, and with as little apparent injury. The nest is composed of grass, intermixed and lined with down, and the eggs are usually 9 to 12 in number.

In a wild state this species always pairs, but under domestication becomes polygamous, and the care of the young is left entirely to the female. The domestic duck was known in England as early as the 13th c. and for a long period has been extensively kept in poultry yards both for its flesh and for its eggs. By careful breeding large size combined with great delicacy of flesh has been attained. Besides the farm-yard duck there are about a dozen distinct breeds kept in this country. Of these the Aylesbury, Pekin, Rouen, and Cayuga are the most valuable. Ducks can be kept in confinement and at a distance from streams or ponds, through at somewhat greater expense than if allowed a wide range and access to a body of water. They need a warm house, and if not allowed to roam a large yard should be provided. As they are not good sitters the eggs should be placed under a hen or artificially hatched. The period of incubation is about 28 days. Ducks mature very early. If well fed they can be marketed at ten weeks old, when they will dress at a weight from 8 to 11 lbs. per pair. They require considerable animal food as well as farinaceous.

Other species of *Anas* in N. America are the Black duck (*A. obscura*), similar but dusky, with no white visible; the Green-winged and the Blue-winged Teal; the Cinnamon Teal of the s.w., the male mostly chestnut; the Gadwall or Gray duck, speculum white; and the Widgeons, top of the head white. Of other genera are the Shoveller or Spoon-bill, the Pin-tail, the beautiful Wood or Summer duck, the Canvas-back (closely resembling the Redhead, but with the dorsal wavy lines broken), the Big Scaup duck (with wavy lines, but the fore parts black), the Lesser Scaup (the sides also with waved lines), the Ring-necked duck, the Golden Eye or Garrot, the rarer Barrow's Golden Eye (the white on the wing bisected with black), the puffy-headed Butter-ball or Buffle-head or Dipper or Spirit duck, the Old Squaw or Long-tailed duck (with no speculum), the Ruddy duck (mottled silvery-white beneath), etc. See also MERGANSER: EIDER: SCOTER: SURF DUCK: etc.

DUCK-BILL (*Ornithorhynchus*, or *Platypus*): genus of *Mammalia* of the order *Monotremata* (q.v.). Only one

species is fully ascertained, *O. paradoxus*, or *P. anatinus*. It inhabits the rivers of Australia, Papua, and Tasmania. In the Australian colonies it is generally called Water Mole. The first descriptions of this singular quadruped were received with incredulity, and even when a stuffed specimen was brought to England, it was suspected to have been ingeniously fabricated. The whole length, including bill and tail, is usually 20 to 23 inches. The body is rather long and compressed, thickly covered with very glossy hair, among the roots of which there is a layer of soft short waterproof felt or wadding. The head is small and round, with small bright eyes, and no external ears, though the internal ears are perfectly developed, and the hearing acute, and instead of the muzzle, mouth, and teeth of an ordinary quadruped, the creature is furnished with a bill like that of a duck, but broader in proportion, near the extremity of the upper mandible of which the orifices of the nostrils are placed. The bill is covered with a leathery membrane. There are no true teeth, but the bill has small transverse laminæ, like the bill of a duck; and at its base, on each side of each jaw, are two horny protuberances without roots or bulbs. The tongue is beset with villosities, does not extend to the extremity of the bill, and bears at its base what has been described as another tongue of a thicker form, and with two little fleshy points in front. The legs are short; the fore-feet each have five toes, with strong burrowing claws, and a connecting membrane for swimming, which extends even beyond the claws, but is capable of being folded back, so as not to impede their use in burrowing. The hind-feet are smaller than the fore-feet; they have each five toes armed with claws, and webbed, but the web does not extend beyond the base of the claws. The hind-feet of the male are armed with sharp spurs, connected with a gland, which are merely rudimentary in the female. These spurs were formerly erroneously supposed venomous. The tail is strong, broad, and flattened, about half as long as the body, covered with longer and coarser hairs, and nearly naked on its under surface. The duck-bill has some peculiarities in common with birds, and some with reptiles; for the anatomical characteristics of the duck-bill and the Echidna, see *Monotremata*. It lives chiefly in the water, and seeks its food by means of its bill in the mud. Its food consists chiefly of aquatic insects, mollusks, and the like; and in confinement, it can be fed on worms, minced meat, or egg, and bread and milk. It makes serpentine burrows of great length—20 or even 50 ft.—in river-banks. One end opens below water; and the highest part of the burrow is enlarged into a kind of nest. The ornithorhynchus was originally reported oviparous, but after 1822 was believed to be ovoviviparous; and it was only at the British Assoc. at Montreal, 1884, that it was announced that it had been definitely ascertained actually to lay real eggs, as also the other Monotremes, the Echidnas. The eggs are inclosed in a strong, white, flexible shell. The development of the egg resembles that of the reptilia. The young are

suckled from the mother's mammary glands, though there are no external teats; the beak of the young is comparatively short and flexible. The duck-bill is lively and active, and so readily alarmed by the appearance of danger, as not to be easily shot, diving before aim can be taken. It is usually to be seen with only its head above water, under which it can remain for seven or eight minutes. The day-time it spends in the burrow, and feeds at night. The Australian natives dig it out zealously, esteeming it as food. Its voice resembles the growl of a small puppy. It carefully dresses and pecks its fur. When asleep, it rolls itself up into a ball.

DUCK-CREEK: water-course of central Australia, largest of the channels which drain into the Darling (q.v.).

DUCK'ING-STOOL: apparatus formerly in use in Britain for the punishment of scolding wives. The ducking-stool grew out of the cucking-stool, which was not, as many have supposed, a mere difference of name for the same thing. The cucking-stool of itself did not admit of the ducking of its occupants. It was a simple chair in which the offender was placed, usually before her or his (for the cucking-stool was not so specially for women as the ducking-stool) own door, to be pelted and insulted by the mob. In conjunction with another instrument of degradation, however—the tumbrel—the cucking-stool was occasionally used for ducking; but the ducking-stool *par excellence* was specially for purposes of immersion. There were various examples of the ducking-stool. Sometimes it 'consisted of a rough strong chair attached to one end of a beam, which worked on a pivot on a post bedded into the ground at the edge of the dam,' or the river. 'The woman was placed in the chair with her arms drawn backward: a bar was placed across her back and in front of her elbows;' another bar held her upright, and there were cords to tie her securely in. The executors of the punishment then took hold of a chain at the opposite end, and gave her a ducking on the 'see-saw' principle. The practice of ducking commenced in the latter part of the 15th c., and prevailed generally through the kingdom until the first part of the 18th c., and in isolated cases, as we have seen, even into the 19th century.

DUCK'WEED (*Lemna*): genus of plants, referred by many botanists to the nat. ord. *Araceæ*, but regarded by others as the type of a small nat. ord., *Lemnaceæ*, which consists chiefly of floating plants, mere flat green fronds, with roots hanging loosely in the water, and unisexual flowers—destitute of calyx and corolla—bursting through a membranous spathe in their margin. The *Lemnaceæ* are distributed through all parts of the world. Several species cover the surface of stagnant ponds with green vegetation. Their flowers and fruit are rarely seen, but they spread rapidly by new fronds budding from their margins.

DUCORNET, *dü-kor-nā'*, Louis Cesar Joseph: 1806, Jan. 10—1856, Apr. 27; b. Lille, France: artist. Born with-

out arms, he learned in early childhood to use his feet for hands, and when 13 years old showed such skill in drawing with his toes that Watteau received him as a pupil in the Lille Acad. of Design. There his ambition to become a painter received wholesome encouragement. At the end of 3 years he took the first prize for a drawing of the human figure from life, and received a pension from the city, which the govt. subsequently increased. He then went to Paris for more advanced study, painted *The Parting of Hector and Andromache*, 1828, and presented it to his native city. He continued painting till within a few weeks of his death. His last work of note, *Edith finding the Body of Harold*, was ordered by Napoleon III. and exhibited 1855.

DUCT, n. *dŭkt* [F. *duit*, a duct—from L. *ductus*, led—from *duco*, I lead]: that which guides or directs; a tube or pipe for conveying a fluid, specially said of vessels of the body; a canal.

DUCTILE, a. *dŭk'tĭl* [F. *ductile*—from L. *ductĭlis*, that may be drawn—from *ductus*, led]: easy to be drawn out in length, as wire; that may be extended by beating; malleable; yielding; tractable. DUCTIL'ITY, n. *-ĭ-tĭ*, property of bodies by which they are capable of being drawn out in length, while diminishing in breadth, without fracture or separation of parts. Ductility is noticeable peculiarly in the case of metals. It is possessed also by gums, glues, resins, and some other bodies, which, when softened by water or heat, may be drawn into threads. Clays, when moistened, become ductile. Metals are ductile, generally speaking, at any temperature, but their ductility is much influenced by temperature; some—brass, for example—are more ductile at ordinary temperatures than when hot. Metals are ductile nearly in the order of their malleability (q.v.), the order of their ductility being as follows, beginning with the highest: gold, silver, platinum, iron, copper, zinc, tin, lead, nickel, palladium, cadmium. Some, however, as iron, are more ductile than malleable. The ductility of gold and glass is surprising; see article DIVISIBILITY for an account of the fineness to which gold-gilt silver wire and glass tubes have been drawn. The ductility of glass at red heat seems to have no limit; at high temperatures, this brittle substance may be drawn into threads finer than any hair, and of the highest flexibility. Its flexibility, indeed, according to some, increases in proportion to the fineness to which its threads are drawn, and it is conceived possible to convert glass into cloths for wearing apparel. DUCTILITY, n. obsequiousness. DUC'TILELY, ad. *-lĭ*. DUC'TILENESS, n. DUCTILIMETER, n. *dŭk-tĭl-ĭm'ĕ-tĕr* [Gr. *metron*, a measure]: in *metal.*, an instrument invented by M. Regnier for ascertaining the relative ductility of metals.

DUCTLESS, a. [duct-less]: without a duct (q.v.); applied in anat. to the four glands, thyroid, adrenal, thymus, spleen.

DUCTOR, n., *dŭk'tor* [L., from *ductus*, pp. of *duco*]: a leader; a guide; in *calico-print.*, a gauge or straight-edge

to remove superfluous material, as one on the color-roller of a calico-printing machine, inking-rollers, etc. DUCTOR-ROLLER, n. in *print.*, a roller to conduct ink to another roller or cylinder.

DUCTUS, n. [L., from *duco*, I conduct]: in *anat.*, a canal, conduit; *Ductus ad nasum*, conveying tears into the nose.

DUD, n. *dŭd* [Gael. *dud*, a rag; *dudag*, a little rag]: in *OE.* and *Scot.*, a rag; a kind of coarse wrapper. DUDS, n. plu. clothing, especially of inferior quality.

DUDE, n. *dūd:* a man devoted to dress and fashion; a fop.

DUDEEN, n. [Ir.]: clay tobacco pipe with short stem.

DU DEFFAND, *dü dā-fŏng′*, MARIE DE VICHY CHAMROND, Marquise: see DEFFAND, DU.

DUDEVANT, *düd-vŏng′*, AMANTINE LUCILE AURORE, Madame: French authoress, who attained extraordinary celebrity under the name of GEORGE SAND: 1804–1876, June 8; b. Paris; descended by the father's side from the famous Marshal de Saxe. Her maiden name was Dupin. After having received a strict conventual education (1817–20), she married M. Dudevant 1822; but in a few years, finding the lack of congeniality of sentiment intolerable, she arranged a separation in 1831, and went to Paris, where at first she was hard pushed to secure a livelihood. Her first literary efforts made their appearance in the *Figaro*. In conjunction with her friend and companion for the time, Jules Sandeau, from whose name she formed her *nom de plume*, she wrote a romance, entitled *Rose et Blanche* (1832), which only occasionally rises above mediocrity, and gave no hint of the splendid ability first fully developed in *Indiana*, published in the same year. This romance, in which a glowing heart, deeply wounded by the pressure of social relations, gives vent to its feelings, excited considerable interest. This was increased to the utmost by the succeeding romances—*Valentine* (1832), *Lélia* (1833), *Jacques* (1834), *André* (1835), *Leone Leoni* (1835), and *Simon* (1836). During the next two years, she published a great variety of works, in which she showed herself deeply influenced by the times in which she was living. In addition to her purely imaginative productions, Madame Dudevant found time to contribute miscellaneous essays and political articles to the journal *Le Monde*, so long as it was edited by Lamennais. She was much occupied at this time with philosophical and theological speculations, and their influence may be traced in the *Spiridion* (1839), and the extraordinary piece of prose poetry, *Les Sept Cordes de la Lyre* (1840). She cherished, moreover, republican ideas of the wildest nature, which appeared conspicuously in the *Compagnon du Tour de France* (1840), and in *Pauline*. Her brilliant literary success having now placed her in comfortable circumstances, she obtained a legal divorce from her husband, and thus secured possession of a portion of the property which she had brought to him as her dowry. She now occupied her-

self with the education of her two children, and spent her time, sometimes in Paris, sometimes at her estate in Berri, where she had passed her childhood, or in journeys into Switzerland and Italy. A dispute with the editors of the *Revue des Deux Mondes*, which, 1833–41, had regularly published her works in chapters before they appeared in a separate form, induced her to start the *Revue Indépendante*, in conjunction with P. Leroux and Viardot. For this new review, she wrote *Horace*, *Consuelo*, and *La Comtesse de Rudolstadt* (1842–3), three romances deeply imbued with democratic feelings and sentiments, which are apparent likewise in *Jeanne* (1844), and which in the *Meunier d'Angibault* (1845) are shown as altogether socialistic. Numerous works flowed from her rapid pen between this period and the revolution of 1848, in all of which her socialistic sympathies predominate; but though the logic be not convincing, the vigor and purity of her imagination are undeniable, as always with Madame Dudevant. Even those who disapprove her exaggerated and one-sided ideas and views of life, must admire the perfect form, the captivating style, the plastic finish, and the great affluence of thought and sentiment in all her productions. Her finest romances are *Valentine*, *André*, and, in particular parts, *Consuelo*, her best known work. Of her smaller pieces, *La Mare au Diable* is a master-piece of its kind, and indeed, from an æsthetic point of view, the most complete production of her pen. After the revolution of February, Madame Dudevant for a short time wasted her talents on the barren politics of the day. She subsequently applied herself to writing plays, which were received less favorably than her novels. In 1854 she published *Histoire de ma Vie;* 1871, *Journal d'un Voyageur pendant la Guerre;* 1873, *Impressions et Souvenirs*. See her *Correspondence* (6 vols. Par. 1881–84), and Miss Thomas's *George Sand* (Lond. 1883).

DUDGEON, n. *dŭj'ŭn* [W. *dygen*, anger, grudge: comp. Ger. *degen*, a sword]: inward anger or resentment; sullenness; a dagger; the root of boxwood, formerly employed in making handles for daggers—so named from its curious wavy markings. HIGH DUDGEON, in a spirit of sullen indignation; evincing so much resentment as to draw the dagger to be revenged.

DUDLEY, *dŭd'lĭ:* parliamentary borough in a detached part of Worcestershire, in the south of Staffordshire, England; 26 m. n.n.e. of Worcester, 8½ m. w.n.w. of Birmingham. It is a well-built town, and a chief seat of the iron trade. On the n.e. of the town are the beautiful ruins of an old castle, founded 760 by Dodo, a Saxon prince. It was demolished in the time of the civil wars of Charles I., was rebuilt, but was burned down 1750. In the vicinity are iron and coal mines, and limestone quarries. The limestone is Silurian and full of organic remains; it is wrought out of caverns, and brought to the kilns by way of a tunnel one mile and three-quarters long, through the basalt of the Castle Hill. Saline springs are near. The chief manufactures are fire-irons, grates, nails, vices, chain-

cables, other iron utensils, and glass. Dudley sends one member to parliament. Pop. (1901) 48,773.

DUDLEY, Benjamin Winslow, m.d., ll.d.: 1785, Apr. 12— 1870, Jan. 20; b. Spottsylvania co., Va., surgeon and lithotomist. He graduated at the Univ. of Penn., 1806; studied with noted surgeons in London and Paris 1810–14; settled in Lexington, Ky.; organized the med. dept. of Transylvania Univ. 1817; became prof. of surgery and anatomy there and delivered 9 lectures each week; and continued in active practice till 1854. He made a specialty of lithotomy, and performed a total of 225 operations with but 6 fatal results.

DUDLEY, *dŭd'lĭ*, Charles Edward: 1780, May 23— 1841, Jan. 23; b. Staffordshire, England: merchant. He was educated for a commercial career in London; went to the E. Indies as supercargo; emigrated to the United States 1794, and settled in Albany, N. Y. He became prominent as a merchant and as a democrat in politics, served as state senator 1820–25, mayor of the city 1821–28, and U. S. senator, succeeding Martin Van Buren, 1829–33. He applied the greater part of his leisure to astronomical study. A few years after his death his widow, Blandia Dudley, gave $70,000 toward founding an observatory in his name at Albany, and subsequently increased the amount to over $100,000.

DUDLEY, Joseph: 1647, Sept 23—1720, Apr. 2; b. Roxbury, Mass.: lawyer. He graduated at Harvard Univ. 1665, and began studying theology, but soon abandoned it for law. He became a local magistrate 1673; was a commissioner for the New England colonies 1677–81; assisted in negotiating a treaty with the Narragansett Indians 1675; went to England to procure a confirmation of the old charter and failed, but was appointed pres. of New England by the king 1685, and became chief-justice of the supreme court 1687. Subsequently he was arrested and sent to England as a friend of Gov. Andros, but was there received with much favor. He was appointed chief-justice of N. Y. 1690, dep. gov. of the Isle of Wight, 1693, and capt. gen. and gov. of Mass. 1702, serving till 1715. His son, Paul Dudley (1675, Sept. 3—1751, Jan. 21) graduated at Harvard Univ. 1690, became atty. gen. of Mass. 1702, and chief-justice 1745. He founded the Dudleian course of lectures at Harvard, and published a number of essays on the natural history of New England 1720–35.

DUDLEY, Thomas: 1576–1652, July 31; b. Northampton, England: gov. of Mass. He served with the English army in Holland, joined the non-conformists, came to America as dep. gov. of Mass. 1630, was gov. 1634–40 and 1645–50, and became maj. gen. 1644. Shortly before his death he settled in Roxbury, Mass., where he left a considerable estate. He was father of Joseph Dudley, and father-in-law of Gov. Simon Bradstreet, of Mass.

DUD'LEY LIME'STONE: highly fossiliferous Silurian limestone belonging to the Wenlock Series, which forms

some of the most picturesque eminences around the town of Dudley, England. The masses of corals, shells, and trilobites which abound in this rock, form, when weathered, extremely beautiful cabinet specimens.

DUD'LEY LO'CUST: popular name for a trilobite (*Calymena Blumenbachii*), (q.v.), very abundant in the Dudley limestone.

DUDLEY-TRILOBITE: same as Dudley Locust.

DUE, a. *dū* [OF. *deu;* F. *dû*, due: OF. *deuvre*—from L. *debērĕ*, to be necessary as a duty, to owe: It. *dovuto*, duty; right: comp. Gael. *duth*, what circumstances warrant]: that ought to be paid or done to another; owing to; fit; proper; that ought to arrive at a certain time specified, as a ship or train; exact or exactly, as due east; seasonable; becoming; capable of being referred to or explained by: N. that which is owed or may be justly claimed; right; just title; a toll or fee. Du'ly, ad. *-lĭ*, properly; fitly; regularly; at the proper time. Dues, n. plu. *dūz*, certain taxes, rates, or payments. Due'ful, a. in *OE.*, fit; becoming. Due-bill, n. a brief written acknowledgement of indebtedness, differing from a promissory note in not being payable to order or transferable by mere indorsement. Over-due, behind in time or payment. To give the devil his due, to give credit even to the worst of men when they deserve it.

DUEL, n. *dū'ĕl* [F. *duel*—from It. *duello*—from Lat. (*duellum*), a battle between two (which, as Cicero, *Orat.* 45, says was the old form of *bellum*, war)—from *dŭŏ*, two]: a battle or combat between two persons with deadly weapons, at a time or place indicated in the challenge by one party, or duly arranged. Du'ellist, or Du'elist, or Dueller, or Du'eler, n. one who fights in single combat. Duello, n. *dū-ĕl'lō* [It.]: in *OE.*, the rule or law of duelling; a duel.—A duel generally takes place in the presence of witnesses, called seconds, who regulate the mode of fighting, place the weapons in the hands of the combatants, and enforce compliance with the rules which they have laid down.

No trace of the duel, as an institution, is found in the history of the classical nations of antiquity, the Latin word from which ours is derived having been used to signify a war between two nations. So long as men continued barbarians, their personal quarrels were no doubt decided in the ancient world as national quarrels still are in the modern world, by an appeal to physical force. But though war has been in all times the practical solution of strife, it was not till the middle ages that it came to be regarded as a means, in any sense judicial, of settling disputes. Hitherto, it had determined who was able to prevail, justice being set aside; but it was a new view that it would determine who ought to prevail on the principles of justice. The rationale of the *judicial combat* or wager of battle was probably twofold. On the one hand, and generally among the people, it depended on a belief that

God would interfere directly and miraculously in the conflict to protect the innocent, and to punish the guilty, and that thus the weakest combatant who had God on his side would prove more than a match for the strongest destitute of His aid. But there was a view of the matter not so directly superstitious, and resting rather on a confusion between the principle of the original constitution of rights and the principle of the transmission of rights. All human rights originate in the powers and faculties which God has given to man, and it was supposed that as the right originated in power, its continued existence in the individual could be ascertained by ascertaining whether the power still existed in him. The error consisted, as we have said, in confounding the principle of the constitution of rights with the principle of the transmission of rights. If a field claimed by two competitors had as yet been appropriated to nobody, or had been abandoned, and was, as lawyers say, *res nullius*, the fact as to which of the two claimants ought to become the possessor might be ascertained by judicial combat. But if it was already the property of one of them on a title which was to be held sacred, and the question was which of the two had this sacred title, that fact could never be determined by ascertaining which would have been in a condition to constitute it for the first time, had it been nonexistent. The principle of the private duel, so far as it had any principle at all and was not merely a piece of barbarous and irrational foppery, was precisely the same as that of the judicial combat. But the latter had been applied to a class of cases which admitted of legal investigation and decision, and it was consequently abandoned in the days of Queen Elizabeth; whereas the former was supposed to be a means of redressing such wrongs as hardly can come within the cognizance of a human tribunal; and the consequence was that it continued in observance in Britain until recently, and is still in vigor in many continental countries of Europe. In the United States, where it has never been prevalent in the northern states, it has now become so nearly extinct that its occurrence even in the southern states is exceptional.

Like the other peculiarities of mediæval life, the duel originated probably with the Germanic nations. It is said to have been introduced into legal proceedings in lieu of an oath by Gundebald, king of the Burgundians, 501. Louis le Débonnaire was the first of the French kings who permitted litigants to appeal to arms. The practice was prohibited by Henry II., in consequence of a noted duel in his presence between his friend, Francis de la Chastaigneraie, and Guy Chabot de Jarnac, in which the latter was slain. The royal edict, however, was totally ineffectual, and the practice of private duelling has generally prevailed more extensively in France than in any other country. Francis I. patronized it by declaring that a lie could be borne without satisfaction only by a base-born churl, and still more by the example which he set in challenging his own great rival Charles V. In 1599, the parliament of

Paris declared all persons who were either principals or seconds in duels to be rebels to the king. But its efforts were unavailing; and it is said that during the first 18 years of Henry IV., no fewer than 4,000 gentlemen perished in this foolish manner. In 1609, Henry added to the existing penalties, introducing even punishment by death in extreme cases. But these regulations were forced upon him by popular feeling; he had himself no aversion to the practice, and when he gave permission to Crequi to fight Don Philip of Savoy, he added: 'If I were not the king, I would be your second.' The consequence of this feeling was, that he readily granted pardons to those who had violated the laws which he had been forced to enact, and these laws not unnaturally produced an effect the very reverse of their ostensible object. Duelling acquired the charm of what the French call 'forbidden fruit' and thus became a fashionable and favorite vice. In the reign of Louis XIII., the custom was so prevalent, that Lord Herbert, the English ambassador, wrote home to his court that there was scarcely a Frenchman worth looking on who had not killed his man. It seems, however, that it was from negligence in enforcing the royal edicts that duelling then reached so alarming a height; for it was during this reign that two noblemen, the greatest duellists of the day, the Count de Bouteeville and the Marquis de Beuron, were tried and beheaded for persisting to fight. In the commencement of the reign of Louis XIV., duels with four or five on a side began to be fought; and two very sanguinary affairs of this description having taken place, in which several persons of the highest rank were slain, the king determined to put an end to the practice. He published an edict 1679, forbidding it under the highest penalties, which, unlike most of his predecessors, he had the firmness to inflict; and this measure, together with a solemn agreement which was entered into among the nobility themselves, led at that time to its almost total abolition.

The duel does not seem to have existed in England in Anglo-Saxon times, and was probably introduced at the Conquest. In its judicial form, it was not entirely obsolete in the reign of Queen Elizabeth; and Sir Henry Spelman records a trial by battle, which terminated without actual combat in 1571. Private duelling was common in Elizabeth's reign and in that of her successor, by whom a severe statute against it was enacted in Scotland (1600 c. 12). During the Civil Wars, men's minds were too much occupied with questions of grave importance to leave time for questions of etiquette, and the duel consequently declined; but it became exceedingly prevalent during the dissolute reign of Charles II. Some attempts were made to suppress it in the reign of William III., both in England and in Scotland, and, in 1712, the subject was recommended to the attention of parliament in the queen's speech. But the bill which was brought in by the government was thrown out, and the practice continued to prevail. When

the eustom of wearing the sword was abandoned, the number of duels diminished, though it was then that their irrational character may be said to have attained its maximum. The pistol was substituted for the sword, and the doctrine of chanee—whieh was reduced to an absurdity by the medical duel of a couple of pills, one eomposed of bread and the other of poison— was inaugurated. Since that period, the practice has fallen into disrepute, by the gradual operation of publie opinion, and in Great Britain it may probably be now regarded as finally abolished. By the law of that eountry, the act of killing in a duel has always been regarded as murder, however fair the duel may have been; but while the practice was countenanced by public opinion, it was generally found impossible to induce a jury to convict. That a verdict of acquittal could not be looked for with the same security in the present day, is probably a good guarantee against the resort to the duel. In the British army, Articles of War, issued 1844, denounced penalties so severe on duelling that it has utterly ceased. In France it still appears to a limited extent. See ORDEAL; SINGLE COMBAT.

The duels of the students at the German universities, of which so much has been said and written in this country, are nothing more than fencing-matches with sharp weapons. They are foolish, but not deadly affairs, as the seeonds, who are also armed, always interfere to prevent serious bloodshed.

Düelling was introduced into the United States by two servants who undertook to settle a private grievance with deadly weapons in Plymouth, Mass., 1621. The govt. has prohibited it under severe penalties in the army and navy, where the practice was common in revolutionary days and for many years afterward; and the states generally have enacted strong statutes against it. The killing of Alexander Hamilton by Aaron Burr, 1804; of the great naval hero, Decatur, by his former superior officer, Capt. Barron, 1820; of Congressman Cilley, of Me., by Congressman Graves, of Ky., 1838; and of Charles Dickinson by Andrew Jaekson, caused great public excitement, and aroused a strong sentiment against the practice, partieularly in the northern states. Though Andrew Jaekson had been engaged in a number of duels as principal and second, when he became pres. he attempted to check duelling in the army and navy (where many valuable lives had been lost in the murderous process of affording 'gentlemanly satisfaction' on all manner of pretexts), by dismissing from the navy four officers who had been engaged in affairs of alleged 'honor.' But neither public sentiment, the articles of war, nor the state statutes have been able entirely to prevent the practiee, though in the northern states it has become rare. Between 1880–88 several duels were fought in Ky., Va., Md., and S. C., according to the exacting provisions of the ancient 'eode of honor.' Like all infractions of law they were arranged and conducted with studied secreey, yet within a few days they became matters of quite general conversation.

The bitterness of political strife expressed in public speech and in the newspaper press have been the most prevalent causes of duelling in modern days. As late as the winter of 1881–2, a southern state presented the spectacle of a noted duellist working with all his energy to induce the legislature to relieve himself and others of the disabilities incurred by duelling, at the very moment when he was a candidate before that body for election to the U. S. senate. Both ambitions were gratified, and he is now (1888) chairman of one of the most important of the senate committees. The state statutes generally provide that when one of the parties in a duel is killed, the survivor is guilty of murder, and the seconds, surgeons, and spectators are accessory to the fact; that fighting a duel, even where there is no fatal result, is of itself a misdemeanor; and that anyone being directly or indirectly engaged in a duel is forever disqualified from holding public office. In some states a special oath is administered to certain officers that they have not been engaged in any manner in a duel within a specified time, and that they will not be in the future.

DUENNA, n. *dū-ĕn′nă* [Sp. *duena*, fem. of *don*—from L. *domĭna*, the mistress of a family]: in *Spain*, an old woman kept to guard a younger one; a governess.

DUER, *du′ĕr*, William: 1747, Mar. 18—1799, May 7. He was aide-de-camp to Lord Clive, gov. gen. of India, 1762; came to the United States 1768; purchased a large tract of land on the upper Hudson river, from which he subsequently supplied the British navy with timber for masts and spars; became a judge of co. courts, member of the provincial congress and committee of safety of N. Y., of the committee that drafted the first constitution of the state and of the continental congress; was sec. of the treas. board 1789; and asst. sec. of the treas. under Alexander Hamilton; and produced a great financial panic by his failure, 1792.—His son, John Duer (1782, Oct. 7—1858, Aug. 8), became a lawyer, commissioner to revise the statute laws of N. Y. 1825; associate judge of the superior court, and chief-justice 1857; and published several legal works.

DUER, *du′ĕr*, William Alexander: lawyer: 1780, Sept. 8—1858, May 30; b. Rhinebeck, N. Y.: son of William Duer. He interrupted his study of law by a service as midshipman in the navy under Decatur, 1798; was admitted to the bar 1802; became a partner of Edward Livingston, dist. atty., and mayor of New York; settled in Rhinebeck 1812; was an earnest promoter of canal legislation while a member of the assembly; was judge of the supreme court of N. Y. 1822–29, and was then elected pres. of Columbia College, New York, where he labored with great effectiveness till 1842. A course of lectures delivered by him to the senior class of the college on *Constitutional Jurisprudence of the United States* was published 1833 and revised 1858. After his retirement he delivered several public addresses, and published a life of his grandfather under the title of *Life of William Alexander, Earl of Stirling* (1847).

DUET, n. *dū-ĕt'* [It. *duetto*—from L. *dŭŏ*, two]: a song or air in two parts, for two voices or instruments. DUET'-TO, n. *-tō* [It.]: a duet. *Note.*—On the piano, *a duet* is played by two persons at one instrument: in a *dūō*, each of two players has a separate piano.

DUFF, n. *dŭf* [a provincial pronunciation and spelling of *dough*]: in *naut.*, a stiff flour pudding boiled in a bag.

DUFF, *dŭf*, ALEXANDER, D.D., LL.D.: great promoter of and laborer in Indian missions: 1806, Apr. 25—1878, Feb. 12; b. at a farm near Pitlochry, Perthshire, Scotland. He studied at the Univ. of St. Andrews with great success. In 1829 he resolved to go out to India as a missionary from the Church of Scotland; and in Oct. of that year, having been ordained, he set sail from Portsmouth for India. On the passage out, he was wrecked on a barren island n. of the Cape of Good Hope, and at length reached his destination after a disastrous voyage of eight months. At the 'Disruption' in 1843, the missionaries in India being obliged to declare with which party they would connect themselves, Duff cast his lot with the Free Church, and for 20 years carried on with great energy the missionary work at Calcutta under the auspices of that body. Duff visited his native land twice after 1829, before returning altogether in 1863. He was moderator of the General Assembly of the Free Church 1851 and '73, and was prof. of Evangelistic Theology in the Free Church colleges. He took an important part in various philanthropic societies and schemes. Dr. Duff was gifted with great fervor and extraordinary fluency as a speaker, and he wrote voluminously. Among his writings are *New Era of the English Language and Literature* (1837), *Missions the Chief End of the Christian Church* (1839), *India and Indian Missions* (1839), *The Indian Rebellion, its Causes and Results* (1858). There is a life of Duff by Dr. George Smith (2 vols. 1879).

DUFF, n. [local term—origin uncertain]: the *débris* of forest growth, chiefly decayed trunks of spruces, with needles, cones, etc. Duff holds water like sponge; when very dry it is easily set on fire, and burns and smokes without flame.

DUFFEL, or DUFFLE, n. *dŭf'fl* [said to be so called from *Duffel*, in the Netherlands]: a thick, coarse, woolen cloth with a rough nap; a sort of flannel felt.

DUFFER, n. *dŭf'fĕr* [a mere corruption of *dudder*, a hawker of cheap and flashy goods—from Scot. *dud*, a rag]: a hawker of sham jewelry; a sham of any kind; an awkward person—a slang term.

DUFFERIN, *dŭf'ĕr-ĭn*, FREDERICK TEMPLETON HAMILTON BLACKWOOD, Earl: b. Florence, Italy, 1826, June 24; d. 1902, Feb. 12: British statesman. He was educated at Eton and Christ Church, Oxford, where he took his degree; succeeded to his father's title 1841, July 21; was lord in waiting on the queen several years, accompanied Lord John Russell to Vienna 1855, was appointed British

commissioner in Syria for the purpose of inquiring into the massacre of Christians there 1860, was under-sec. of state for India 1864–66, and under-sec. for war 1866–7. In 1878, Dec., he was appointed chancellor of the duchy of Lancaster and paymaster-gen., and held the office till 1872, Apr., when he was appointed gov. gen. of the Dominion of Canada. He occupied this post till 1878, Oct., and was succeeded by the Marquis of Lorne. In 1879, Feb., he was appointed ambassador to Russia; 1881, May, was transferred to Turkey; 1882, Oct., assumed control of all British relations with Egypt and the settlement of all questions growing out of Arabi's rebellion; appointed viceroy of India 1884; ambassador to Rome 1888, and to Paris 1892; created baron 1850, nominated a knight of St. Patrick 1863, appointed lord lieut. of the co. of Down 1864, sworn a privy councilor 1868, made an earl of the kingdom 1871, Nov., elected president of the Royal Geographical Soc. 1878, May, and created a G.C.B., G.M.S.I., and G.M.I.E., 1884. He had travelled extensively; published *Narrative of a Journey from Oxford to Skibbereen during the year of the Irish Famine* (1848), *Letters fromHigh Latitudes*, an account of his yacht voyage to Iceland (1860), *Irish Emigration and the Tenure of Land in Ireland* (1867), *Mr. Mill's Plan for the Pacification of Ireland Examined* (1868), and *Contributions to an Inquiry into the State of Ireland;* and received the degree LL.D. from Harvard Univ., and the Univ. of Dublin 1879, and D.C.L. from Oxford 1880.

DUFFY, *dŭf'fĭ*, Sir CHARLES GAVAN: b. Monoghan, Ulster, Ireland, 1816; d. 1903, Feb. 9: journalist and statesman. He was educated in Belfast, became sub-editor of the Dublin *Morning Register* 1835, soon afterward editor of an influential newspaper in Belfast, studied law and was called to the bar, and established the *Nation* in Dublin 1842. This paper was made the organ of the Young Ireland party, attained a large circulation, supported O'Connell, and advocated a repeal of the Union. In 1844 he was tried and convicted of sedition with O'Connell and other leading repealers, but the conviction was set aside by the house of lords on an appeal. Two years later he aided the young Ireland party in establishing the Irish confederation, and, 1848, was tried with Smith O'Brien, Thomas F. Meagher and others for treason—felony, but after four indictments it was found impossible to convict him. He then revived the suppressed *Nation*, defeated his former prosecutor for parliament 1852, was a founder of the Tenant League and the independent Irish party in the house of commons, and resigned his seat and emigrated to Australia 1856. After practicing law in Melbourne, he re-entered political life, was appointed minister of public works in Victoria 1857, minister of lands 1858 and '62, spent two years in Europe, and became prime minister of Victoria 1871. He resigned 1872, was gazetted a knight 1873, re-elected to the legislative assembly 1876, and unanimously chosen speaker 1877, May. He published

Young Ireland: a Fragment of Irish History, 1840–1850 (Lond. 1880), and a sequel to it, *Four Years of Irish History*, 1845–1849 (1883).

DUFOIL, n. [L. *duo*, two, and *folium*, a leaf]: in *bot.*, a two-leaved flower; an orchid, *Listera ovata*, called Dufoil from having only two leaves.

DUFOUR, *dü-fôr'*, Guillaume Henri: Swiss general, 1787–1875; b. Constance, of a Genevese family. While Switzerland formed part of France, he studied at the Polytechnic School of Paris for two years; and on leaving it, received an appointment as officer of engineers in the French army. At the fall of Napoleon, he entered the Swiss service, and rapidly rose to the rank of colonel. When the govt. survey of Switzerland was undertaken, he was appointed director—at the same time acting as principal of the Swiss Military School at Thun. In 1840, he published *A Treatise on the Artillery of Ancient and Mediæval Times;* and in 1842, *A Manual of Military Tactics.* In 1847, he was raised to the rank of general, and intrusted with the command of the army employed against the Sonderbund. He defeated their forces at Freiburg (Nov. 13) and at Lucerne (Nov. 24); and by his prompt and skilful maneuvers, secured a triumph for the liberal party in time to prevent the interference of foreign powers, diplomatically or otherwise. The diet voted him a gift of 40,000 francs, and for a time he was the most popular man in Switzerland. His politics were not, however, those of the Genevese democrats, and in 1848 they deprived him of his public offices. In 1856, he was again admitted to the council of Geneva, and sent on a special mission to Louis Napoleon *à propos* of the dispute between Switzerland and Prussia about Neufchatel (see Kern). In 1864, he was president of the Geneva conference.

DUFRESNE, *dü-frān'*, Charles, Seigneur Du Cange, hence generally styled merely Ducange: French historian and linguist: 1610, Dec. 18—1688, Oct. 23; b. Amiens; of an ancient family of Picardy. After having received the rudiments of a scientific education at the Jesuits' College in his native town, he studied law at Orleans, and in 1631 became parliamentary advocate at Paris, where he resided till his death. There was scarcely any branch of science with which he was unacquainted, but his favorite studies were classical philology and history. Among his historical works are the *Histoire de l'Empire de Constantinople sous les Empereurs François* (Paris 1657). He also edited, with other scholars, the *Corpus Historiæ Byzantinæ* (Paris 1680), and Joinville's *Histoire de Saint Louis, Roi de France.* His two principal works are the *Glossarium ad Scriptores Mediæ et Infimæ Latinitatis* (3 vols. fol. Paris 1678; much enlarged by the Benedictines of St. Maur, 6 vols. fol. Paris 1733–36, to which four supplementary vols. were added by Carpentier, a Benedictine), and the *Glossarium ad Scriptores Mediæ et Infimæ Græcitatis* (Paris 1688). Both works display great learning, good judgment, and admirable industry, and are valuable contributions to the study of the

history and antiquities of the middle ages. A new edition of the Latin Glossary was published by G. A. Henschel (7 vols. 4to Paris 1842–53), and a supplementary vol. (*Latino-Germanicum*) was added by Diefenbach (Frankfort 1857); a completely new edition in 10 vols. began to appear 1882. Dufresne left a large quantity of valuable manuscripts, which were collected in the Univ. of Paris.

DUG, n. *dŭg* [Sw. *dægga*, to give suck: comp. Gael. *dioghail*, to suck closely: Skr. *duh*, to milk (see DAIRY)]: the teat or pap of a cow or other beast.

DUG: pp. of the verb DIG, which see.

DUGDALE, *dŭg'dal*, SIR WILLIAM: 1605—1686, Feb. 10; b. Shustoke, near Coleshill, Warwickshire: antiquary and historian. He studied at the free school of Coventry, and after the age of 15, under the care of his father. His antiquarian pursuits led to his being created (1638) a pursuivant-at-arms extraordinary by the name of Blanche Lyon; and shortly afterward he was made Rouge Croix pursuivant-in-ordinary. During the civil war, Dugdale adhered to the royal cause, and lived for several years in Oxford, employed in researches for his great works. On the Restoration, Dugdale was made Norroy king of arms, and in 1677 Garter king of arms; at the same time, the king, much against the wishes of Dugdale, whose estate was but a poor one, conferred upon him the honor of knighthood. He died at his estate of Blythe Hall. His chief works are *Monasticon Anglicanum* (Lond. 1655–61–73), (which, though for the most part written by another antiquary, named Dodsworth, was concluded, arranged, indexed, and corrected by Dugdale); a new and greatly enlarged edition of the *Monasticon* by Bandinel, Caley, and Ellis, was published 1817–30, and re-issued 1846; *The Antiquities of Warwickshire* (1656); second ed. revised and continued (1730); *The Baronage of England* (1675–6); *Origines Juridicales, or Historical Memoirs of the English Laws*, etc. (1666; 3d ed. 1680); *Short View of the Late Troubles in England* (Oxford 1681); *The Ancient Usage in Bearing Arms* (1682; new. ed. 1811). Dugdale bequeathed upward of 27 folio MS. volumes, written in his own hand, to the Univ. of Oxford. They are now in the Bodleian Library, the Heralds' College, and the Ashmolean Museum.

DUGONG, n. *dū'gŏng* [Mal. *duyong*], (*Halicore*): genus of mammalia, of the family *Manatidæ* (q.v.), order *Sirenia;* distinguished by molar teeth with flat summits, and composed of two cones laterally united, the incisors of the upper jaw elongated almost into tusks; the tail forked or crescent-shaped; and the swimming-paws destitute of any vestiges of nails. One species alone has been thoroughly ascertained and accurately described. The dugong (*H. Indicus*, or *H. Dugong*) of the Indian Archipelago is said to attain a length of 20 ft. when full grown, although it is more frequently seen 8 to 12 ft. long. It has some resemblance to the seal and the walrus, and in general form it much resembles the manatee. It is called sometimes the

sea-cow. The skull is remarkable for the sudden bending downward of the upper jaw almost at a right angle. The upper lip is large, thick, and fleshy, covering the prominent incisors, and forming a kind of snout, 'something like the trunk of the elephant cut short across.' The eyes are very small, and are furnished with a third eyelid or *nictitating membrane*. The skin is smooth and thick, but yields no oil. The anatomy of the dugong has been very carefully examined. It exhibits a remarkable peculiarity, in the ventricles of the heart being completely detached from one another. Its osteology has been found to exhibit interesting points of correspondence with that of the *Pachydermata*, as in the numerous ribs, etc.; its dentition resembles in some particulars that of the elephant; its digestive apparatus is adapted to vegetable food, differing very much from that of the whales, dolphins, and other ordinary cetaceans. It feeds on the algæ which grow on submarine rocks in shallow seas. Its lips are of much use in gathering together its food. It often comes to the surface to breathe, and is said to utter a peculiar cry. It is gregarious. The female produces one young one at a birth, and shows an affection for it which is proverbial among the Malays. When the young one is taken, the mother is easily secured. The dugong is generally pursued in boats, and killed by spearing. The flesh is highly esteemed even by Europeans, and is described as resembling young beef. That of full-grown animals is, however, comparatively coarse, on which account, and the greater facility of capture, the younger ones are more frequently killed. According to Rüppell, it was with the skin of the dugong of the Red Sea that the Jews were directed to veil the tabernacle.

DUGUAY TROUIN, *dü-gā′ trô-ăng′*, Rene: one of the most celebrated naval officers of France: 1673, June 10—1736, Sept. 27; b. St. Malo. He left the school at Caen, where he was to have studied theology, with the reputation of a good-for-nothing fellow, and betook himself to the sea. His career, which was very brilliant, may be divided into two parts, the first 1689–97, the second from 1697 to the close of his life. During the former, he cruised about as a sort of privateer, inflicting immense damage on the enemies of France. The English merchantmen suffered severely from his attacks. In the Channel, on the coasts of Ireland and Holland, in the Spanish Main, everywhere fortune followed Duguay. Louis XIV., as a reward for his daring exploits, admitted him into the state navy, and gave him the command of a frigate. The second part of his career was as brilliant as the first. In 1707, he engaged a part of the English fleet at the entrance of the Channel, burned one ship, captured three others, and about 60 transports; but the most glorious of his triumphs was the attack and capture of Rio Janeiro 1711, after hostilities had lasted for 11 days. The city was ransomed for 610,000 cruzades. The S. American expedition of Duguay Trouin, which cost Portugal in all about 30,000,000 francs,

put the seal to the celebrity of the French commander. He was successively named *chef d'escadre*, member of the council of the Indies, lieut. gen., and naval commandant at Brest. In 1731, Louis XV. sent Duguay Trouin into the Levant, to chastise the barbarians inhabiting the neighboring coasts, and to obtain reparation for the damages done to French commerce. In this also Duguay Trouin was successful. His *Mémoires* were published by Beauchamps.

DUHAMEL, *dü-hâ-mĕl'*, WILLIAM: 1827–1883, Aug. 15; b. Md.: physician. He graduated at the Md. Univ. of Medicine, 1849; was appointed adjunct prof. of surgery in the Georgetown Med. College, 1852, attended all the occupants of the White House during three presidential terms, and was chief physician to the U. S. prisons in the District of Columbia 10 years. He was a member of several medical and scientific societies, and a frequent contributor to professional periodicals.

DUIDA, *dwē'dâ:* mountain of Venezuela, S. America; lat. 3° 30′ n., and long. 66° 10′ w. It is of conspicuous form, being perpendicular on two sides, and bare at the summit. Height 8,500 ft. It forms a landmark for the voyager on the Orinoco.

DUISBURG, *dō'ĭs-burch:* town of Rhenish Prussia, about 15 m. n. of Düsseldorf, in a fertile district, between the Ruhr and the Rhine, with both of which it is connected by a canal. It is surrounded partly by walls, flanked with towers, which are now somewhat decayed, and partly by a rampart and ditches. Duisburg contains a gymnasium founded 1599, a monastery of Minorites, and five churches, two of which—that of St. John the Baptist, dating from 1187, and St. Salvador's are worthy of notice. Its manufactures are numerous and important, including tobacco, soda, sulphuric acid and other chemicals, iron castings, soap, starch, and sugar; there is also large trade in wine and colonial produce. In the neighborhood are iron-works and coal mines. Duisburg is an ancient town. In the 13th c., it was a member of the Hanseatic League, and afterward a free town of the German empire, but at the close of the war in 1815 it was transferred to Prussia. Pop. (1900) 92,730.

DUKE, n. *dūk* [F. *duc*—from L. *ducem*, a leader—from L. *duco*, I lead: It. *duca*]: a title of nobility of the highest order; a chief ; a prince. DUKE'DOM, n. the territory, title, or quality of a duke. DUCHESS, n. *dŭch'ĕs* [F. *duchesse*] the wife or widow of a duke. DUCHY, n. *dŭch'ĭ* [F. *duché*]: the dukedom or possessions of a duke. DU'CAL, etc.: see DUCAL. DUKE HUMPHREY, see under DINE.—*Duke* was a term applied originally to any military leader. Gibbon informs us that the title came into use first when Constantine separated the civil and the military commands in the provinces, which had been exercised in common by such men as Agricola. From that time forth, the military governors of provinces were either counts or dukes. But these titles originally stood to each other in an opposite re-

lation to that which they afterward assumed. 'It should be recollected,' says Gibbon (III. 57, cap. xvii.) 'that the second of these appellations—that of duke— is only a corruption of the Latin word, which was indiscriminately applied to any military chief. All provincial generals were therefore *dukes*, but no more than ten among them were dignified with the rank of *counts*, or companions, a title of honor, or rather of favor, which had been recently invented in the court of Constantine.' See COUNT. 'A gold belt,' continues Gibbon, 'was the ensign which distinguished the office of the counts and dukes; and besides their pay, they received a liberal allowance, sufficient to maintain 190 servants and 158 horses. They were strictly prohibited from interfering in any matter which related to the administration of justice or the revenue; and the command which they exercised over the troops of their department, was independent of the authority of the magistrates.' When the Goths, and Franks, and other barbarians successfully invaded the provinces of the empire, they preserved the titles of count and duke, if they had not already borrowed them from the Romans. But among races who owed their supremacy to the sword, no dignity could prevail over that of the commander of an army; and the dukes, as military chiefs, acquired a marked pre-eminence over the counts, whose lofty functions under the empire had been partly civil, and partly military. The only exception under the first Merovingians was in the case of the Count of the Palace. See COUNT. In the hierarchy observed by the Franks and other Teutonic races the ordinary count became the lieutenant of the duke and the government of the latter extended to several provinces; whereas that of the former was confined to one province, or even to a single locality. The power of the dukes grew so rapidly in consequence of the dissensions of the Merovingians, that, toward the end of the sixth c. (582), they arrogated to themselves the right to dispose of the crown. Among the causes which tended to raise the power of the dukes, was the immense wealth which had been acquired by the great provincial families. The chiefs who had attached themselves to the fortunes of Clovis had been richly endowed with conquered lands. After the close of the 7th c., they overshadowed the crown, and the title of prince and chief (*chef*) began to be attributed to them. It has been said that the *ducs-maires* of the palace sometimes assumed the title of archduke (q.v.). Under the second dynasty the title of duke retained all its dignity and importance, and it was to the successive invasions of local upon central power, that feudality owed its origin. The concession, tacit or express, of hereditary power and independent jurisdiction, first to the central province known as the Isle of France, and then to Aquitaine, extended itself, under the Carlovingians, to Burgundy, Normandy, and Gascony; and on the accession of Hugo Capet, to all the other subaltern tenures. Having become unlimited masters of their respective legations, the dukes did not

long delay to proclaim their title to be as good as that of the king. They assumed the crown and the sceptre, promulgated laws for their subjects, struck money with their own image and made war in their own name against the crown, with whom they balanced and several times divided the supreme authority. The confederation of the feudal lords had assumed such dimensions, that about the period of the Norman invasion of England nothing remained directly under the crown except a few towns, of which Rheims and Laon were the chief. The rest of the kingdom was divided among the dukes and the counts, under an obligation, which they almost always evaded, of service and fidelity to the crown. But the Capetiens had been enlightened by the fall of two dynasties and were careful to delegate to no other hands the duchy of the Isle of France, which had so often been a stepping-stone to the throne. When it became extinct in 887, it was not re-established, and that event was the signal for the restoration of a national character to France. The duchy of Gascony was joined to Aquitaine 1052; and both provinces, with Normandy, were finally re-united to the crown, 1204, by confiscation. This latter duchy was sometimes given to princes of the blood, but without any separation of its fiscal arrangements from those of the kingdom. A part of Aquitaine was given up to England 1259, and ceded back to France 1458. The ducal sovereignty of Burgundy was extinguished 1477, that of Brittany 1514, of Narbonne 1229, and of Toulouse 1361.

The duchies which were subsequently granted to members of the royal family—that of Bourbon, erected 1327; of Orleans, 1344; of Auvergne, Berri, Touraine, Valois, and Alençon, at subsequent periods—enjoyed none of the privileges of independent sovereignty which had belonged to the ancient duchies. The subordination of these fiefs was absolute, and the princes who governed them, though placed on the steps of the throne, were only the first subjects of the realm. The tendency to diminish the actual power which anciently had attached to the ducal title, was still more apparent in the case of those dukedoms which were conferred on the representatives of illustrious noble families. The Montmorencies were created dukes 1551, but they enjoyed no other privileges than those of titled nobles, and their position had no analogy whatever to that of the old provincial dukes. The duke-peers, as they were called, were simply the first class of nobles in France, as are dukes in England; but they differed from English dukes, in that, after the extinction of the Comté pairie d'Eu, 1775, the duke-peers alone sat in parliament. Several prelates enjoyed this rank—for example, the abp.-duke of Rheims, the bp.-duke of Laon, and the bp.-duke of Langres. The Abp. of Paris took the same rank after the erection of St. Cloud into the ducal peerage 1674. There were still two other sorts of dukes in France—the dukes who were not hereditary peers, and the dukes for life, or patent dukes, who date only from the reign of Louis XIV. Swept away

by the Revolution, the title was restored by Napoleon, who conferred it, with rich endowments, on his marshals. Several ducal peers were created by Louis XVIII. and Charles X.

In Germany the dukedom passed through phases very similar to those in the early history of France. For what is special to the position of the nobility of that country, see GRAF.

Dukes, in the older European sense, do not appear ever to have existed in England. The title seems not to have been known earlier than the reign of Edward III., and from the first it was a mere honorary distinction. The Black Prince, who was created duke of Cornwall (see below) 1335, was the first English duke. In 1350, Henry, the king's cousin, was created duke of Lancaster; and when he died, and his daughter was married to John of Gaunt, the king's son, the title was transferred to him—his elder brother, Lionel, being made duke of Clarence. In the succeeding reign—that of Richard II.—the two younger sons of Edward III. were created, the one duke of York, the other duke of Gloucester. The dignity was thus, in the first instance, confined to the royal house. But the families of Holland and Mowbray very soon received the same title; and one of the Beauforts, an illegitimate son of John of Gaunt, was raised to the peerage by the title of duke of Exeter. In the reign of Henry VI., the title was granted more widely and there were at one time ten duchesses in his court. The Staffords, Beauchamps, and De la Poles belong to this period. King Henry VIII. created only two dukes—one his illegitimate son, whom he made duke of Richmond, the other Charles Brandon, who married his sister, the French queen, and was made duke of Suffolk. Queen Elizabeth found only one duke when she came to the throne—Thomas Howard, Duke of Norfolk—attainder or failure of male issue having extinguished the rest of them. After the attainder and execution of the duke of Norfolk, there was no duke in England, except the king's sons, till Ludovic Stuart, a relative of the king's, was made duke of Richmond 1623. In the same year, Villiers was made duke of Buckingham. On the Restoration, Charles II. restored the Seymours to the rank of dukes of Somerset, and created Monk duke of Albemarle. But the habit of conferring this dignity on the illegitimate sons of the monarch was still adhered to, as in the case of the duke of Monmouth, illegitimate son of Charles II.; and the duke of Berwick, of James II. Of the existing dukes, besides the descendants of Charles II., there are only three families which date their dukedoms before the Revolution —*viz.*, the Howards, the Seymours, and the Somersets. It was William and Anne who, by advancing a very considerable number of the first families of peers to the rank of duke, altogether changed its character.

THE DUCAL CORONET is composed of a circle of gold, with eight strawberry or parsley leaves, of equal height above the rim.

Duke of Cornwall. The duchy of Cornwall was by royal charter of Edward III. conferred on his son Edward the Black Prince. King Henry IV. subsequently included the duke of Cornwall in a patent in favor of his son Henry Prince of Wales. But since that time, the duchy has belonged of right, without any special grant, to the king's heir-apparent from the time of his birth. On the death of the king's eldest son without issue, during the life of his father, the duchy descends to the next brother. In the event of the death of the heir-apparent without issue, and without leaving a younger brother, or in case of the heir-apparent succeeding to the crown, the duchy of Cornwall merges in the crown until the birth of a son calls it again into existence. The uncertainty thus arising in regard to the duchy has produced much confusion in regard to leases held of the duke, and various acts of parliament have been passed, from the 21 James I. to the reign of the present queen, to regulate this matter. The duke of Cornwall formerly possessed 'royal jurisdiction and crown rights, giving liberty to send burgesses to parliament, and appointing the sheriffs, admirals, and other officers.'—Carew's *Cornwall.* At the present day, there is a separate chancellor, and attorney and solicitor-general for the duke of Cornwall. The revenues of the duchy are considerable, arising partly from the rents, etc., of the different manors, and partly from the dues on tin, which is produced in large quantities from the Cornish mines. There is a special court for the settlement of questions arising among the miners, called the Stannaries Court (q.v.).

DUKE OF EXETER'S DAUGHTER: instrument of torture resembling a rack, said to have been invented by the dukes of Exeter and Suffolk during the reign of Henry VI. This curious instrument was for some time preserved in the Tower of London. Blackstone avers that it was never put into use.

DUKE OF YORK'S SCHOOL: popular designation for the *Royal Military Asylum* at Chelsea. Frederic, duke of York, 1801, used his influence for the formation of a soldiers' orphan asylum; and in 1803, schools were opened for 700 boys and 300 girls, children of deceased soldiers. The institution has been kept up ever since for the boys, of whom 500 are now maintained, but was a failure as to the girls. The boys are wholly supported as well as educated. They are not bound to serve the state after they leave the asylum; but most of them nevertheless enter the army. A soldier's son has not a *right* of admission; a selection is made according as vacancies may occur. When the boys leave the school, those who do not enter the army are apprenticed to trades. The expenses are defrayed by an annual parliamentary grant.

DUKHOBORTSI: see Duchobortzi.

DUKINFIELD, *dū'kĭn-fēld* or *-fĕld:* township in the n.e. of Cheshire, 42 m. from Chester, separated from Ashton-under-Lyne in Lancashire by the Tame. It has

large cotton-factories, iron-foundries, fire-brick and tile-works, and collieries. Astley's New Pit in this township, 690 yards in depth, is one of the deepest coal-mines in the world. Pop. (1901) 18,929.

DULCAMARA, n. *dŭl'kă-mā'ră* [L. *dulcis*, sweet; *amārŭs*, bitter]: hedge-plant, commonly called 'bitter-sweet' or 'woody-nightshade,' so named from its stalks or root when chewed, first tasting bitter, and then sweet; the *Solānum dulcămāra*, ord. *Solanācĕæ:* see BITTER-SWEET: SOLANUM.

DULCAMARIN, n. *dŭl-kăm'a-rĭn* [Eng. *dulcamara*]: in *chem.*, C_{11} H_{12} O_5. An amorphous substance obtained from the stalks of *Solanum dulcamara*. It forms a yellow, transparent, resinous mass, which is sparingly soluble in ether, but readily in alcohol.

DULCAYNAS, n. *dŭl-kā'năs* [Sp.]: the name of a larger sort of oboe, or small bassoon. As it is thought that the instrument was brought into Spain by the Moors, the word may be derived from the same root as the Egyptian Dalzimr, both instruments being of the oboe, or reed kind.

DULCE: gulf in Costa Rica on the coast of the Pacific, covering abt. 800 sq. m. Into it empties the small river Dulce.

DULCE, *dôl'sā* or *dôl'thā:* lake in the republic of Guatemala, Central America, on the e. coast: 30 m. long, 12 m. broad; with 18 ft. of water near the shore and from 30 to 60 ft. in deeper parts. It is connected with the Gulf of Honduras by Golfete lake and Dulce or Angostura river, and is fed by the Polochic river. The village of Izabal is on the s. bank; and Livingston, named after Edward Livingston of New York, is on the left bank. Vessels drawing less than 6 ft. only are able to pass the bar at the mouth of the Dulce river.

DULCET, a. *dŭl'sĕt* [OF. *doucet* or *dolcet*, sweet—from L. *dulcis*, sweet]: sweet to the taste or ear; melodious; harmonious. DULCIFY, v. *dŭl'sĭ-fī* [L. *facĭō*, I make]: to make sweet; to sweeten. DUL'CIFYING, imp. DUL'CIFIED, pp. *-fīd.*

DULCIAN, n. *dŭl'sĭ-an*, or DULCINO, *dŭl-sē'nō* [It.]: in *mus.*, the name of a species of small bassoon.

DULCIANA, n. *dŭl-sĭ-â'na* [It.]: in *mus.*, a word now applied solely to a soft and delicate-toned organ stop consisting of very small-scale flue pipes. Originally, a dulciana was a kind of hautboy; and these terms are still found on some organ stops; but in some cases the stop is not actually reed, but the pipes by their peculiar shape, narrow at the mouth, and widening gradually toward the top, produce a reedy quality of tone. The dulciana stop was introduced into England, or perhaps invented, by the celebrated organ-builder Snetzler. Stops of this kind are most usual on the choir organ.

DULCIGNO, *dôl-chēn'yō* (Slavonic *Mkronich*, Turkish *Olgun*): port of Montenegro, 20 m. s.w. of Scutari, and

till 1880 a Turkish town.—*Old* Dulcigno fell into the hands of the Turks 1571. In the 16th and 17th c., it was the most famous den of pirates on the Adriatic; but the Turks burned the whole Dulcignote fleet. New Dulcigno stands a little farther inland. In 1880, with the approval of Turkey, the representatives of the Western Powers arranged that Dulcigno and its territories should become Montenegrin, instead of certain inland districts assigned to Montenegro in fulfilment of the Treaty of Berlin. The Albanians (perhaps not quite spontaneously) insisted on the retention of Dulcigno, and an Albanian League was formed with this view. The dispatch, 1880, Sept, of a fleet representing the Great Powers, did not immediately secure the transfer; it was not till the end of November that, after endless procrastination, the Turks expelled the Albanian troops by force, and the Montenegrins were able to take possession. Pop. abt. 5,000, of whom 3,500 are said to be Mohammedan. Dulcigno is the seat of a Rom. Cath. bishop.

DULCIMER, n. *dŭl'sĭ-mėr* [Sp. *dulcemele*—from L. *dulcis*, sweet; Gr. *melos*, a tune or air]: musical instrument resembling a flat box with sounding board and bridges, strung with thin wire; played on by striking the wires with a small piece of wood in each hand.

DULCIN, or Dulcine: see Dulcose.

DULCINAN: see Dulcitan.

DULCINESS, n. [L. *dulcis*, sweet]: sweetness; softness; mildness; easiness of temper or disposition.

DULCINIST, n. *dŭl'sĭn-ĭst* [named after the founder *Dulcinus*]: in *ch. hist.*, one of a sect, followers of Dulcinus, a layman of Lombardy in the 14th c. who taught fantastic doctrines concerning the Trinity. He was burnt by order of Pope Clement IV.

DULCITAN, n. [Eng. *dulcite*, and *anhydride*]: in *chem.*, $C_6H_{12}O_5$, dulcinan, the anhydride of dulcites obtained by heating dulcite for some time at a temperature of over 360° F., or by boiling it with hydrochloric acid. It is a neutral syrup which volatizes at 120°, and is reconverted into dulcite by heating it with water and baryta.

DULCITANIDES, n. *dŭl'sĭ-tăn-īdz* [Eng. *dulcitan*, and suff. *-ide*]: in *chem.*, compounds formed by heating dulcite with organic acids in sealed tubes at 200°. They may be regarded as dulcitan in which two or four atoms of hydrogen are replaced by acid radicals.

DULCITE, n. *dŭl'sīt:* ($C_6H_8OH_6$), a saccharine substance obtained by Laurent in 1850 from an unknown sugary plant from Madagascar, which was in rounded lumps, but crystalline when broken through. By dissolving in water, filtering from impurities, and evaporating, the dulcite was deposited in large transparent, lustrous, modified monoclinic prisms. Dulcite has a specific gravity of 1.46. It has a slightly sweet taste, no odor, and no rotatory effect on light. It is soluble in water, very

sparingly soluble in alcohol. It combines with metallic oxides; the compounds with the alkalies and alkaline earths are crystalline and soluble in water.

DULIA, n. *dū-lī′ă* [Gr. *douleia*, service, slavery: F. *dulie*]: an inferior worship or service paid to saints—distinguished from *latria*, the worship paid to God. HYPER-DULIA, *hī′pĕr-dū-lī′ă* [Gr. *hyper*, over, above]: the worship higher than *dulia*, and less than *latria*, paid to the Virgin Mary.

DULL, a. *dŭl* [Goth. *dvals*, foolish: Icel. *dvali;* Sw. *dwala*, giddiness, stupefaction: O.H.G. *dualm*, torpor, sleep: Gael. *dall*, blind, obscure—the primary idea is a stoppage of the faculties or powers proper to the subject]: without spirit; not cheerful; stupid; slow of understanding; slow of hearing or seeing; slow to learn; not bright or clear; dim; obscure; blunt; cloudy. DULLISH, a. somewhat or rather dull: V. to make dull; to stupefy; to blunt; to tarnish. DUL′LING, imp. DULLED, pp. *dŭld*. DUL′LARD, n. *-lĕrd*, a person of a slow and heavy understanding; a blockhead: ADJ. stupid. DUL′LY, ad. *-lĭ*, stupidly. DUL′NESS, n. state of being dull; slowness and heaviness of intellect. DULL-EYED, *dŭl′īd*, having eyes wanting in vivacious expression and intelligence.—SYN. of 'dull, a.': dismal; dreary; heavy; sluggish; drowsy; sleepy; lifeless; dead; inanimate; doltish; cheerless; gross; obtuse; tarnished; clouded.

DULSE, n. *dŭls*, or DILSE, n. *dĭls* [Gael. *duileasg*, seaweed, dulse—from *duille*, a leaf; *visge*, water—*lit.*, the leaf or plant of the water], (*Rhodomenia palmata*): a sea-weed, one of the CERAMIACEÆ (q.v.), growing on rocks in the sea, and used as food by the poor on the coasts of Scotland, Ireland, and other northern countries, and of the Grecian Archipelago, occasionally also as a luxury by some who have acquired a taste for it. It has a purple, leathery, or somewhat membranous veinless, sessile frond, irregularly cut, with repeatedly forked segments, which are either entire at the edges, or furnished with lateral leaflets, the spores distributed in cloud-like spots over the whole frond. Its smell somewhat resembles that of violets. It is eaten raw or roasted, and with vinegar. In Iceland, it is sometimes boiled in milk. It is an important plant to the Icelanders, and after being washed and dried, is stored in casks, to be eaten with fish. In Kamtchatka, a fermented liquor is made from it. It occurs on our coast, and all parts of the British coasts. Sheep are fond of it.—The name Dulse is given in the s.w. of England to another sea-weed, *Iridæa edulis;* also one of the *Ceramiaceæ*, which has an undivided, obovate or wedge-shaped, flat, expanded frond, very succulent, tapering to a short stalk, and of a dull purple color. It is eaten either raw or pinched between hot irons. PEPPER DULSE (*Laurentia pinnatifida*), another of the *Ceramiaceæ*, has a compressed cartilaginous frond, twice or thrice pinnatifid. It has a pungent taste, and is used as a condiment when other sea weeds are eaten

DULUTH.

DULUTH, *dô-lôth*, Minnesota: city and capital of St. Louis co., at the western end of Lake Superior, 478 m. from Chicago, and 2,370 from San Francisco. The city has an area of 69 sq. m., extending along the lake and harbor and the St. Louis river from Lakeside to Fond du Lac, a distance of 24 m. It has spread e. and w. along the water-line, and northward up the face of the great bluff, which in the course of a mile from the edge of the water rises to a height of 800 ft. There are over 200 m. of streets, paved with macadam and various other materials.

History.—Groselliers, a French fur trader, and his associates were the first white men who visited what is now Duluth. In 1660 they shipped from the head of Lake Superior 60 canoes laden with furs. Daniel Greysolon Du Luth, after whom Duluth was named, was a French officer, who, urged by an adventurous spirit, led a strong party to the westward, following the line of the Great Lakes. He traded with the Indians at Fond du Lac in 1679, and it has been believed that he at one time maintained a camp on Minnesota Point. It was not until 1854 that the Indian title to the territory on which this city is built was extinguished by treaty. An election for the Territory of Minnesota, the object of it being to choose a delegate to Congress, was held on the unorganized, unplatted town-site of Duluth in October 1855. In May 1857, Duluth was incorporated as a town by an act of the territorial legislature. In 1867 a railroad from Duluth to St. Paul was begun and in 1870 the St. Paul & Duluth, the first railroad, was completed. In the same year Duluth was organized as a city, but the Jay Cooke failure of 1872 was a blow to the new mart of commerce and she relapsed into a village, retaining that status until 1890. Real work for the development of the iron ranges began in 1878, and in 1882 the first iron range railroad was completed between Two Harbors and Vermilion Lake. The hand of panic fell hard on Duluth in 1893 and depression lasted until 1899, since which time the city has enjoyed an exceptional share of prosperity.

Government and Public Works.—The mayor, treasurer, comptroller, and two aldermen from each ward are elected by the people for two years; the clerk is appointed by the council. The chief of police, city engineer, city attorney, assessor, the city boards and minor officers are appointed by the mayor. The city owns the water and gas systems. Water is drawn from a point 10 miles down the north shore of the lake, which is never approached by sewage. The city also owns the gas plant and during its ownership has reduced the price of gas from $1.90 to 90 cents per 1,000. There are 50 m. of electric street railway tracks in the city, crossing the river over the great interstate bridge, and bringing all parts of the two cities within a time limit of 35 minutes.

Public Parks and Cemeteries.—The Duluth park system consists of five larger parks, two smaller ones, and

five city squares. Fairmont Park at West Duluth contains 40 acres; Lincoln, at the West End, 50; Central, Central Duluth, 100 acres; Chester Park, East End, 100 acres; Lester Park, extreme East End, 25 acres; Cascade Park, 6th Street and First Avenue west, whose beauties are indicated by its name, covers 4 acres. Portland Square covers a block at West 4th Street and Tenth Avenue east. The main feature of this park system is Rogers boulevard, and the parks Fairmont, Lincoln, Central, Chester, and Lester. The boulevard is a drive of seven miles along the bluffs at a height of 500 feet above Lake Superior, which is itself 600 feet above the level of the sea. There are five cemeteries: Calvary Hill, Forest Hill, Oneota, Park Hill, Scandinavian Union, and Swedish Mission.

Chief Buildings.—Among the chief buildings are the Central High School, the Carnegie library, the State Normal School, the Spalding and St. Louis hotels, the Lyceum Theatre, the Board of Trade, and Federal buildings. The Duluth Public Library building was the donation of Andrew Carnegie. The fund was $75,000. The building and grounds represent an outlay of $93,000. The library now contains 40,000 volumes. Among churches are the Cathedral, and seven other Catholic churches, six Episcopal, six Baptist, one Christian Science, two Congregational, one Swedish Covenant, three Evangelical, 17 Lutheran, 11 Methodist Episcopal, one Unitarian, one Salvation Army Corps, and two Hebrew synagogues.

Educational.—The public school system is of the highest order. There are 32 buildings with an average daily attendance of 8,791 pupils and 258 teachers; in addition to which there are three Roman Catholic parochial schools, an Institute of the Sacred Heart, and the State Normal School. The hospitals have a training school for nurses. The annual expenditure for public school purposes is about $310,000. There are two daily and a number of weekly and semi-weekly papers.

Trade and Commerce.—As the western terminus of the marine traffic of the Great Lakes, Duluth holds an important place in world-commerce. For 1902 the aggregate of arrivals and departures at this port was 9,659. The arrivals numbered 4,816 and the departures 4,843, with a registered net tonnage of 13,927,284. The same year the total receipts of freight at the port were 1,291,357 net tons, of a valuation of $31,431,750, and the shipments were 7,884,236 net tons of a valuation of $65,080,803. The total of freight received and shipped was 9,175,593 tons and the valuation of the same was $96,512,553. The shipments of iron ore for 1902 were 5,598,408 gross tons, as compared with 3,437,955 gross tons in 1901. Two Harbors, which holds the world's season record for the amount of iron ore forwarded from a single shipping point, is a sub-port of Duluth. Its record in 1902 was 5,605,185 gross tons as against 5,018,197 gross tons in 1901. The grain elevator storage capacity is 17,000,000 bushels.

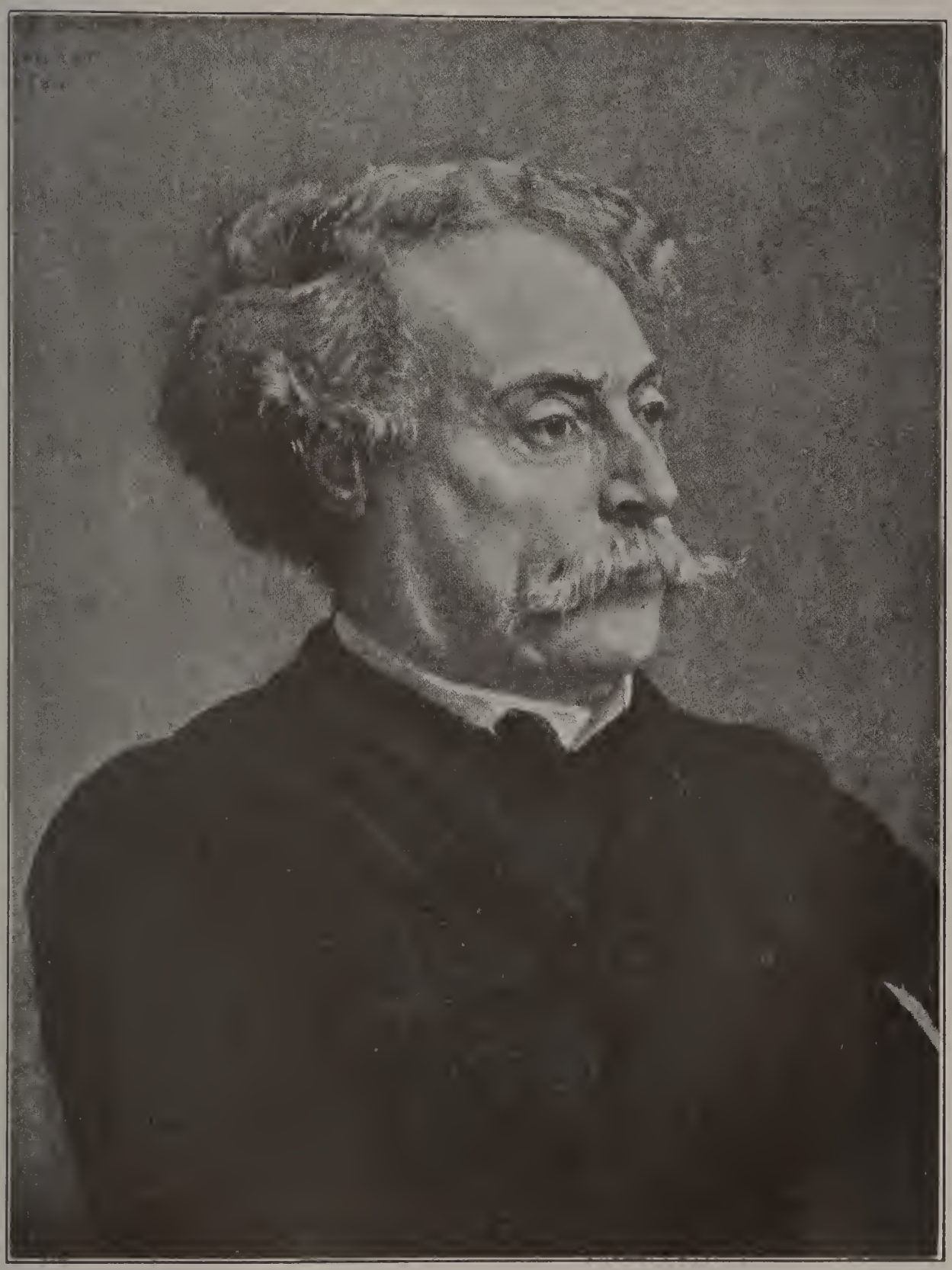
There are two systems, the Consolidated Elevator Company, owning eight houses and having a total capacity of 12,000,000 bushels, and the Peavey system, with a total capacity of 5,000,000 bushels. The latter has the largest concrete elevator in the world and the only one of the kind in the United States, with a capacity of 4,000,000 bushels, and that of the working-house 1,000,000 bushels. For the crop year ending 31 July, 1903, the total receipts of grain at this port were 26,296,921 bushels, of which the Consolidated received 17,900,000 and the Peavey 8,396,921 bushels. The lumber shipments for 1902 amounted to 279,787,788 feet. There are five coal docks, with an average storage capacity of about 1,000,000 tons. The receipts for 1902 were 818,532 tons of bituminous and 87,383 of anthracite. In addition to the lake commerce there are eight railroads centering here: the Northern Pacific; the Great Northern; the Chicago, Milwaukee & St. Paul; the Wisconsin Central; the Chicago, St. Paul, Minnapolis & Omaha; the Missabe & Northern, and the Duluth, South Shore & Atlantic.

Manufactures.—According to the latest accessible reports there were 433 manufacturing establishments in the city, with a capital of $8,872,940; employees, 3,998; wages paid, $2,145,444; cost of materials, $5,861,499; total value of product, $10,628,957; lumber and timber product, $3,800,000; planing mill product, $172,943; foundry and machine, $475,848. The city is remarkably well supplied with water-power by the collection of a vast drainage, which is forced over the rapids of the St. Louis river to a point within the limits of the municipality. These rapids aggregate a fall of nearly 600 feet, and supply a power that is practically unlimited. Pop. (1910) 78,466.

DUMA, *dô'mâ:* the Russian parliament, composed of representatives chosen by the municipal or town councils, from the masses of the people throughout the empire. Its organization is similar to that of the Zemstvo (q.v.), and it originally had similar powers, but these were subsequently greatly curtailed. This, in connection with other wrongs and tyrannies of the government, led to the outburst of revolutionary sentiment which has been so pronounced in Russia since the close of the war with Japan; and which finally, in 1905, compelled the recognition of the government. The constitution of the Duma was set forth in the laws of 1907, Mar. 6. The liberals were a majority of delegates, with the result that bitter hostility to the imperial party and policy developed at the first and all subsequent sessions. This antagonistic attitude alienated the Czar's sympathies and the first Duma was shortly dissolved, a number of the members being arrested or kept under close surveillance. A second Duma was subsequently elected, but shared the fate of the first, being summarily dismissed for defiant conduct. The parliamentary plan is now in abeyance.

DUMAS, *dü-mā'*, ALEXANDRE: a French novelist: 1803, July 24—1870, Dec. 5; b. Villerscotterets; son of the republican gen., Alexandre Davy-Dumas, who was the offspring of the Marquis Davy de la Pailleterie and a negress. The crisp hair and thick lips of Dumas bore testimony to his African origin, a testimony confirmed by the savage voluptuousness and barbaric taste of his partial innumerable compositions. His father died when he was a child, and he had in consequence a very imperfect education. At the age of 20, he came to Paris to seek his fortune, and after a short time received an appointment in the household of the Duc d'Orleans. In 1826, he first appeared as an author in a vol. of *Nouvelles;* but it was not till 1829, when his historical drama, *Henri III. et sa Cour*, was brought upon the stage, that France fairly mistook him for a genius. This work appeared when *Romanticism* was beginning to triumph over *Classicism* in French poetic literature, and was hailed by the advocates of the former as a crowning victory. The Duc d'Orleans, who was delighted with the production, led the applause, on the first night of its representation, in honor of its author. Next morning Dumas was made librarian to his highness. From this period, he became more and more a noted character in Paris, dexterously contriving at once to feast the appetites of the mob, and to continue the companion of princes. In 1846, he accompanied the Duc de Montpensier to Spain, as the historiographer of his marriage. Afterward, he visited Africa; and on his return to Paris, finding his income inadequate to meet the expenses of his costly mode of life, he opened a theatre of his own. The Revolution induced him to attempt a political career; but France, in spite of its discreditable admiration of this literary Cagliostro, had sufficient good sense to turn the cold shoulder to him. In 1853, 'financial considerations' compelled him to seek refuge in Belgium. Subsequently, his pecuniary star being once more in the ascendant, Dumas visited the East. After the conquest of Sicily by Garibaldi 1860, he followed in the wake of the great Liberator, who does not seem, however, to have been imposed upon by his mountebank worship and bombastic enthusiasm.

It would require pages to enumerate all the productions which have been issued under the name of Dumas, but for two reasons this is unnecessary: first, they are for the most part worthless, and secondly, they are for the most part not *his*. Alphonse Karr, in his *Mercantilisme Litteraire* (1845), and M. Eugène de Mirecourt, in his *Fabrique de Romans, Maison A. Dumas et Cie* (1845), have exposed the astounding quackery of this writer. It would seem that Dumas had introduced the 'sweating system, into literature, for he had in his employment a large number of poor authors and literary hacks, whose circumstances or position hindered them from demanding a legitimate emolument for their labor. To these persons, Dumas was in the habit of giving a few brief out-



ALEXANDER DUMAS.

lines of a novel or drama, and then paid them for composing the work, which appeared as the production of Dumas' miraculous pen. Thus it happened that Dumas sometimes contrived to issue more volumes in a year than it was possible for a human being to transcribe in the same period. His best known works are *Les Trois Mousquetaires* (8 vols. 1844), *Le Comte de Monte-Cristo* (12 vols. 1841–45), *La Reine Margot* (6 vols. 1845). It would be unfair to deny the brilliancy of some of his own work, especially the dramatic power of his dialogue, or the ingenuity and interest of many of his plots, though the immorality of the story is often portentous; and of his 60 dramas, several deserved permanent success. He earned $1,500,000 by his pen, but died in miserable poverty. A statue, from a design by Doré, was raised to his memory in Paris, 1883.

DUMAS, Alexandre, or Dumas the Younger: b. Paris, 1824, July 28; d. 1895, Nov. 27; son of Alexandre Dumas. He has followed his father in cynical disregard of morals. His principal work is *La Dame aux Camélias* (1848), a novel on which is founded the notorious opera of *La Traviata*. While not without considerable pathos and power, this is one of the weakest and most absurd books that has ever made a great noise in the world. The heroine is a woman of easy virtue, who contrives to keep up an unsullied affection for the young hero, who is a compound of much foolish sentimentalism and imbecility, with some grosser and baser qualities. Among Dumas' other works may be mentioned *Le Roman d'une Femme*, *La Dame aux Perles*, and several dramatic pieces. *Le Divorce*, a polemical treatise, appeared 1880. He was installed as a member of the French Acad. 1875.

DUMAS, Jean Baptiste Andrè: 1880–1884, Apr. 11: b. Alais, Gard. France: chemist. As a student in Geneva, his chemical and physiological investigations attracted the attention of Decandolle and Prévost. In 1821, he came to Paris, was first a lecturer in the Polytechnic School, then prof. of chemistry in the Athenæum. He was afterward removed to the Sorbonne, and made a member of the Institute. He then abandoned physiology, applying himself to chemical studies, and his views on chemical equivalents, and especially his memoir on the atomic theory, attracted attention over all Europe. His views on the laws of substitutions involved him in a long discussion with the great Berzelius. His researches in organic chemistry, especially his masterly papers on the ethers, on ethereal oils, on indigo, and on the alkaloids, placed him in the first rank of chemists. Chosen a member of the legislative assembly, he held the portfolio of agriculture under the empire, and afterward the office of master of the mint. In 1831, he had been elected a member of the *Académie des Sciences*, and in 1875 he was called to fill the chair of Guizot at the French Academy. He died at Cannes. Numerous contributions from his pen are in the scientific journals, and the *Mémoires de l'Académie*. His chief works are

Traité de Chimie appliquée aux Arts, and *Leçons sur la Philosophie Chimique.*

DUMASIN, n. *dū′măs-ĭn* [from *Dumas,* a French chemist, suff. *-in*]: in *chem.,* pyro-acetic oil, $C_6H_{10}O$: a colorless volatile oil, boiling between 120° and 125°. It is formed with acetone by destructive distillation of acetates. It forms a crystalline compound with acid sulphites. Strong nitric acid converts it into oxalic acid.

DU MAURIER, *dü mō-rė-ā′,* George Louis Palmella Busson: 1834, Mar. 6—1896, Oct. 8: artist; b. Paris, but was a naturalized British subject, and, after studying in Paris till he was 17 years old, took a course in chemistry at University College, London, and afterward studied art in Paris, Antwerp, and Düsseldorf. Soon after his return to England, he became noted for the gracefulness and general excellence of his illustrations in various books and periodicals. For many years he was on the staff of *Punch,* winning recognition as the first society-artist of the time. He also furnished fine illustrations for *Harper's Magazine.* He was an associate member of the Royal Soc. of Painters in Water-Colors. He disdained merely jocose work, and aimed at refined satire. There is monotony in his tall, slender figures and a particular type of long, hatchet-face; but he defended the figures on the whimsical ground that British stature is increasing. He was author of *Peter Ibbetson* (1891), and *Trilby* (1894) novels with illustrations by himself.

DUMB, a. *dŭm* [Icel. *dumbr,* dumb; *dumba,* darkness: Dan. *dum,* dim, obscure: Ger. *dumpf,* that which has its energy kept down, dull: Dut. *dom,* blunt, dull]: mute, silent; unable to speak: V. in *OE.,* to reduce to silence. Dumb′ly, ad. *-lĭ.* Dumb′, n. state of being incapable of speech; muteness. Dumb-ague, popular name of intermittent fever (q.v.) in cases in which the usual chill and succeeding fever are either lacking or slightly developed—the disease being thus marked. In some regions the name is given improperly to the far more serious malignant or congestive form of intermittent fever. Dumb-bells, weights swung in the hands for exercise. Dumb-cake, n. a cake made in silence on St. Mark's Eve with numerous ceremonies, by maids to discover their future husbands. Dumb-cane (*Dieffenbachia seguina,* formerly called *Arum seguïnum* and *Caladium seguinum*), plant of the nat. ord. *Araceæ,* remarkably differing from the plants of that order generally in its almost aborescent character, but agreeing with them in its acridity, which, in none of them, is more highly developed. It has a cylindrical stem, with ringed scars and oblongo-ovate leaves. It is a native of the W. Indies, and has received its English name from its property of producing dumbness when chewed, its acrid poisonous juice causing an immediate swelling of the tongue, accompanied with excruciating pain. The juice is, however, sometimes used to effect the granulation of sugar, A

decoction of the stem is used as a bath and fomentation in dropsy, and the root-stock is used in obstinate constipation. DUMB-CRAFT, n. an instrument somewhat resembling a screw-jack, having wheels and pinions which protrude a ram, the point of which communicates the power. DUMBCRAMBO, n. a child's game in which words rhyming to each other are represented in dumb show. DUMB-FURNACE, n. a ventilating furnace for mines, so contrived that the foul inflammable air from the more remote parts of the mine shall not be brought in contact with the fire at the mouth of the up-cast shaft. DUMB-SHOW, signs and gestures without words. TO STRIKE DUMB, to astonish; to confound; to deprive of the powers of speech through some sudden emotion. DUMB-WAITER, a frame-work made to act between the kitchen and dining room, for conveying food; a piece of furniture for the table, consisting of a revolving series of shelves one above the other, by means of which the various articles required may be reached easily. DUMFOUND, or DUMFOUNDER, v. *dŭm-fown'dĕr*, in *familiar language*, to strike dumb; to confuse with sudden astonishment. DUM'MY, n. *-mĭ*, one who is dumb; a representation of a full package or case, meant to deceive; at *whist*, the name of the open hand when three play; a lay-figure in the establishments of drapers, clothiers, etc., used to show off articles of clothing, styles of dress, or of dressing hair; a mere sham or imitation; a dumb-waiter; a floating barge connected with a pier; in *eng.*, a locomotive with condensing engines for city travel, and consequently avoiding the noise of escaping steam; in *hat-making*, a tool of box-wood shaped like a smoothing iron, used in glossing the surface of silk hats; in *printing*, a book made up of blank or partly printed leaves, to show the size and mechanical make-up only; a person who appears on the stage, but has no words to speak. DOUBLE-DUMMY, at *whist*, a game with two players, and two open hands. DUMB'LY, ad. *-lĭ* in *OE.*, mutely; silently.—SYN. of 'dumb': speechless; noiseless; voiceless.

DUMB: see DEAF-MUTES.

DUMBARTON, *dŭm-bâr'ton:* royal parliamentary, and municipal burgh, seaport, and chief town of Dumbarton county, mainly on the left bank of the Leven, near its junction with the Clyde, 15 m. n.n.w. of Glasgow. It is rather closely built, and consists chiefly of a long semicircular street, parallel to the river. The chief branches of industry are ship-building, marine-engine and machine making, iron-forging, iron and brass founding, and rope-making. It has regular steam-communication with Glasgow, Greenock, and other Clyde ports. Dumbarton is supposed to have been the Roman station Theodosia, and the cap. of the kingdom of the Britons, on the vale of the Clyde. Alexander II., 1222, made it a royal burgh. E. of the alluvial plain at the mouth of the Leven stands the famous and picturesque castle of Dumbarton, on a steep rugged basaltic, rock, which is 240 ft. high, a mile in circuit at the base. and forms nearly an island at high water.

The rock almost hides the town of Dumbarton from the Clyde. The fortress, composed of houses and batteries, studded over the rock, is of considerable historical interest. The rock is accessible only at one part, which is fortified by a rampart. The castle has been often besieged. A huge two-handed sword, said to be that of Wallace, is shown here. Dumbarton gave the title of Earl of Dumbarton to a cadet of the house of Douglas, and commander of a regt. in the royal cause during the troubles in Scotland in the reigns of Charles II and James II. Pop. (1901) 19,985.

DUMBARTONSHIRE, *dŭm-bâr'ton-shĕr* (anciently Lennox, Levanax, or Leven's Field): sickle-shaped county in the w. of Scotland, bounded e. by Loch Lomond, Stirling, and Lanark; s., by Renfrew and the Clyde estuary; w., by Loch Long and Argyll; and n., by Perth; 25 m. long, and $1\frac{1}{4}$ to $18\frac{1}{2}$ broad, with 35 m. of coast; 264 sq. m. On the e. it has a detached part of 30 sq. m., inclosed by Stirling and Lanark. The s. coast on the Clyde is mostly low and sandy. Loch Long forms 20 m. of the w. border. The Gare Loch, one mile broad and six long, forms, with Loch Long, the Roseneath peninsular in the s.w., studded with beautiful villas. Loch Lomond for 24 m. bounds the e. side of the county, the hills rising from a low, narrow, and wooded shore. Here is the romantic scenery of part of Rob Roy's country described by Scott. The n. of the county is mountainous or hilly, rising in Ben Voirlich 3,092 ft. The scenery of Dumbarton is very romantic, and the county forms the route to the West Highlands of Argyll and Perth. The ancient ferry from the Lowlands to the Highlands was between Port Glasgow and Cardross. There are many streams and nine freshwater lakes, the largest being Loch Lomond. The chief rivers are the Clyde, along the s. border: and the Leven, the outlet of Loch Lomond, and running six m. into the Clyde at the foot of Dumbartonshire Rock. The mineral products are coal, freestone, limestone, ironstone, and slates. The climate is mild and humid. The chief industries are shipbuilding and marine-engine making, and bleaching, calico-printing, and dyeing. There are about 75 churches, Established, Free, and United Presbyterian. A portion of the Roman wall of Antoninus runs through the s. e. corner of the county, and ends at Kilpatrick. There are remains of Roman forts, and of a Roman bridge at Duntocher. Stone coffins and Roman vases and coins were found. Pop. (1901) 113,600.

DUMBNESS: a condition of inability to speak or articulate. The most common form thereof is concomitant and indeed resultant from deafness of a congenital (or infantile) origin. The condition thus resulting is called deaf-mutism. (See DEAF). Such persons are also called deaf and dumb. There is not (as was formerly supposed) any concomitant defect of the vocal mechanism; but the child lacking the natural stimulus to incite and direct its articulatory tendencies, fails to imitate and produce sounds. By substituting for auditory guidance the felt positions

(muscle-sense) of the child's speaking organs, an approximation to speech (rarely very distinct or modulated) may be taught (the oral method). In this process the seeing child is aided by the observed positions of the visible portions of the speaker's vocal mechanism; yet the deaf and blind may accomplish the result through the muscle feelings alone. Psychologically dumbness may be of two kinds, as resulting from an inability to project ideas into their articulatory equivalents and again from inability to innervate the apparatus and control it. When struck dumb by fright the impairment is probably of the first type, as may be also the occasional dumbness of hysteria or mental disorder. Loss of speech from failure of cerebral circulation may induce the second type of difficulty. The synonym of dumbness is mutism. The loss of the articulation as a motor defect is sometimes called aphonia.

DUMB-BELL NEBULA: n. in *astron.*, a nebula, called also the Hourglass nebula, situated in the constellation Vulpecula.

DUMETOSE, a. *dū'mĕ-tōs* [L. *dumetum*, a thicket]: in *bot.*, bushy; bush-like.

DUMFRIES, *dŭm'frēs* or *dŭm-frĕz:* royal, parliamentary, and municipal burgh, river-port, and county-town of Dumfriesshire, on the left bank of the Nith, nine m. from its mouth in the Solway Firth, 73 m. s. by w. of Edinburgh. It is irregularly built of red freestone, and is reckoned the cap. of s. Scotland. Two bridges cross the Nith to Maxwelltown, one believed to have been built about 1280, by Devorgilla, mother of John Baliol. It is largely, however, a structure of the 17th c. The most noticeable building is the Mid-steeple, in the centre of the High Street, whose architect was Tobias Bachup, of Alloa. The chief manufactures are woolen cloths (tweeds) and hosiery; and the dye-works have high repute. Dumfries began, it is believed, with the building of a castle, of which nothing remains. The early Scotch and English kings had frequent contests for its possession. About 1200, a monastery was founded here, in the chapel of which Comyn (q.v.) was stabbed by Robert Bruce, 1305. Burns spent the last years of his life here as an exciseman, and the house he resided in, and the mausoleum erected to his memory, are among the most notable objects of the place. Pop. (1901) town, 15,608; Maxwelltown, 5,796.

DUMFRIESSHIRE, *dŭm-frēs'shēr:* border county of Scotland, on the Solway Firth, having Kirkcudbright on the west. It forms an irregular ellipse, 55 m. by 32, with 22 m. of coast-line on the Solway Firth to which its surface slopes; area, 1,103 sq. m. The n. half is mountainous, rising in several summits 2,200–2,700 ft The s. part is undulating. The country on the Solway Firth (q.v.) for 10 m. inland is flat, sandy, and gravelly. Dumfriesshire has three beautiful rivers—the Nith, 45m. long; the Annan, 40; and the Esk, 40; dividing the country into three districts or dales called after the rivers. There are

many small lochs, three near Lochmaben containing vendace. Dumfriesshire consists of Silurian, Permian, and Carboniferous strata, with eruptions of trap. Tortoise footprints have been found in the new red sandstone of Annandale, at Corncockle. The mineral products are coal, limestone, ironstone, lead, and silver. There are extensive lead mines at Wanlockhead. The climate is moist and mild. The chief occupations are agriculture, and the rearing of cattle, sheep, pigs, and green crops. Sheep-farms occupy the hills. The chief exports are cattle, sheep, grain, wool, hams, and bacon. There are fisheries of salmon in the rivers. Dumfriesshire formed part of Valentia in Roman times, and subsequently of the kingdom of Strathclyde. Pop. (1901) 72,562.

DUMMER, *dŭm'ẽr*, JEREMIAH: 1680–1739, May 19; b. Boston: author. He graduated at Harvard Univ. 1699, studied theology, and took his doctor's degree at the Univ. of Utrecht. He resided in London as agent of the colony of Mass. 1710–21, became intimate with Bolingbroke, wrote a number of theological and philosophical works while abroad, published a *Defense of the New England Charters* (London 1728), and presented a collection of 800 valuable books to Yale College. His brother, WILLIAM DUMMER (1677–1761, Oct. 10), became lieut. gov. of Mass. 1716, was gov. and commander-in-chief 1723–29, waged a successful war with the Indians, and bequeathed his farm and mansion for the endowment of Dummer Acad. at Newbury, opened 1763, the first institution of its kind in New England.

DUMMOW, *dŭm-mow'*, or DAMOH: town of India, division of Jubbulpore, Central Provinces; lat. 23° 50′ n., and long. 79° 30′ e.; 775 m. w. of Calcutta. It has a large bazaar, and is abundantly provided with wells. Pop. 10,000.

DUMONT, *dü-mōng'*, PIERRE ÉTIENNE LOUIS: b. Geneva, 1759, July 18; d. Milan, 1829, Sept. 30: philosopher. He studied theology, and after officiating as a minister for a short time in his native town, went to St. Petersburg 1783, where he accepted the charge of the French Prot. Church. In 1785, he left Russia, went to England, and became tutor to the sons of Lord Shelburne, afterward Marquis of Lansdowne. His superior talents, liberal sentiments, and fine character, soon recommended him to the illustrious Whigs of that period; with Sir Samuel Romilly, in particular, he formed a close friendship. During the early years of the French Revolution, Dumont was at Paris, where he became greatly attached to Mirabeau, regarding whom he has given the world much important information in his *Souvenirs sur Mirabeau et sur les deux Prèmières Assemblées Législatives* (not published till 1832, seven years after the author's death). From this work, it appears that Dumont wrote many of the best articles and speeches attributed to Mirabeau. In 1791, Dumont returned to England, and formed an intimacy

with Bentham. This was certainly the most important event in his life. Deeply convinced of the value of that philosopher's views of legislation, he requested his friend to allow him to arrange and edit his unpublished writings on this subject. Bentham gave him his manuscripts. Dumont labored earnestly to abridge, elucidate, correct, and simplify what he had received. The results appeared in his *Traité de de Législation Civile et Penale* (Geneva 1802), *Théorie des Peines et des Récompenses* (Geneva 1810), *Tactique des Assemblées Législatives* (Geneva 1815), *Preuves Judiciares* (Geneva 1823), and the *Organization Judiciaire et Codification* (1828, posthumous publication). Dumont returned to Geneva 1814, and became a member of the representative council.

DUMOURIEZ, *dü-mô-re-ā'*, Charles Francois: 1739, Jan. 25—1823, Mar. 14; b. Cambrai: French general. He entered the army 1757, and served in Germany during the Seven Years' War. On the conclusion of hostilities 1763, Dumouriez, who possessed a restless, adventurous genius, went from one country to another, seeking active employment. Under Louis XVI., he held the office of commandant of Cherbourg, where he began a great naval establishment. As the revolution drew on, Dumouriez began to attach himself to the popular party. In 1790, he became connected with the Jacobin Club, and during the same year was appointed military commandant of Lower Normandy. After holding for a short time the office of minister of foreign affairs, he became lieut. gen. in the army of the North. The allies were advancing in great force. By a series of bold and rapid maneuvers, Dumouriez prevented his enemies from sweeping over the plains of Champagne, and finally took up his position at Grand-Pré. Succors quickly arrived, and the victory of Kellermann at Valmy compelled the invaders to retreat. It is generally admitted that by his admirable strategic movements at this critical period Dumouriez saved France. A winter campaign in Belgium followed, and Dumouriez overthrew the Austrians under the Duke of Sachsen-Teschen and Clairfait at Jemappes, 1792, Nov. 5, 6. The campaign of 1793, which aimed at the complete conquest of the Netherlands, was opened with the siege of Maestricht; Breda and other places were taken by the French; but at Neerwinde, Dumouriez sustained a severe defeat from the Austrians under Coburg. Dumouriez's Jacobinism had been cooling for some time, on account of the anarchy prevailing at Paris, and when commissioners were sent to remonstrate with him on account of his monarchical leanings, he told them nothing could save France from the horrors of anarchy but a constitutional monarchy; Dumouriez then entered into secret negotiations with Coburg, evacuated Belgium, and promised to exert himself on behalf of the Bourbon family. He was accused of being a traitor by the authorities at Paris; but when requested by the commissioners to proceed to the capital and stand his trial, he answered by handing over the representatives

of the people to the Austrians. He next endeavored in vain to win the army over to his plan of marching upon Paris, and re-establishing the royal authority, and had to take refuge, accompanied by the Duc de Chartres, in the ranks of the enemies of France. The Convention set a price of 300,000 francs upon his head. After wandering through many countries of Europe, he finally settled in England, where he died an exile at Turville Park, near Henley-upon-Thames. Besides a multitude of pamphlets, Dumouriez wrote *Mémoires du Général Dumouriez* (Hamburg 1796), and *La Vie et les Mémoires du Général Dumouriez* (3d edit. Paris 1822–24).

DUMOUS, *dū′mŭs*, or DUMOSE, a. *dū-mōs′* [L. *dumōsus*, covered with bushes—from *dumus*, a thorn-bush]: bushy; full of bushes or briers; having a low, shrubby aspect.

DUMP, n. *dŭmp* [Gael. *duan*, a song, a poem, (see DUMPS)]: in *OE.*, a tune, usually slow and melancholy; also a dance; a song, whether gay or merry. MERRY DUMP, a merry humor.

DUMP, v. *dŭmp* [probably from the sound of a blow, from the syllables *dab* or *dub*, a blow; *dab*, a small lump; prov. Sw. *dompa*, to knock, to fall or tread heavily: Icel. *dumpa;* Dan. *dompe*, to plump, as to the ground or into water]: to beat; to strike; to stamp; to unload: N. a blow; an ill-shapen piece; a piece; a bit; a clumsy medal of metal cast in moist sand; a leaden counter; place of unloading; refuse unloaded; in Eng. the sum of one shilling and three pence. DUMP′ING, imp. DUMPED, pp. *dŭmpt*. DUMPAGE, n. the right or privilege of shooting loads of earth, etc., in any certain spot; the charge or fee paid for such privilege. DUMPINESS, n. the state of being dumpy, or thick and short; coarseness and thickness. DUMPY, a. *dŭm′pĭ*, made short and thick by a pat or blow, as on a soft material; short and thick. DUMPY LEVEL, instrument for levelling short distances, having its compass underneath, and a short telescope with wide field. HUMPTY, n. or HUMPTY DUMPTY, n. *hŭm′tĭ-dŭm′tĭ*, a short thick person. DUMP′LING, n. *-lĭng*, a short, thick pudding, usually cooked by boiling. DUMP-BOLT, n., in *ship-build.*, a short bolt driven in to hold planks temporarily, until the through-bolts are driven. DUMPING-CART, n., a cart having a bed hinged to the axle and capable of being tipped to discharge its load. TO DUMP ABOUT, to move about with short steps.

DUMPS, n. plu. *dŭmps* [Dut. *domp* or *damp*, a vapor Ger. *dumpf*, damp, musty]: sulkiness; pettishness; gloominess; sullenness; low spirits; melancholy. DUMP′ISH, a. sullen; dull. DUMP′ISHLY, ad. *-lĭ*. DUMP′ISHNESS, n. In THE DUMPS, in a pettish, sullen temper; out of spirits. *Note:*—This word refers to the old medical theory which ascribed affections of the mind to corresponding diseases of the body, said to have been caused by vapors from the stomach entering the brain.

DUN, n. *dŭn* [imitative of droning sound: Icel. *duna*, to thunder: W. *dwn*, a murmur: AS. *dunung*, a noise]: an

importunate creditor or visitor: V. to urge for payment of a debt; to call or ask for frequently. DUN'NING, imp. importuning. DUNNED, pp. *dŭnd:* see BUMBAILIFF.

DUN, a. *dŭn* [Gael. *donn;* W. *dwn,* brown, dusky: Gael. *duin,* to shut close: Manx, *doon,* to darken]: of a grayish-brown or dark cream color; gloomy: V. to cure fish, as cod-fish, so as to give them a dun color. This is effected by laying them in a pile, after salting, in a dark apartment covered with salt, grass, or other like substance. In two or three months they are opened, and then piled again in a compact mass for two or three months longer, when they are fit for use. DUN'NISH, a. *-nĭsh,* a little brown in color. DUN'-STONE, n. a term applied to certain magnesian limestones of a dun or cream color, extremely hard, and rich in lead and calamine. DUN-FISH, n.codfish cured by dunning.

DUN [see DUNE]: verbal root common to the Celtic and Gothic languages, signifying a hill or height. Besides giving rise to the Fr. *dunes,* Ger. *dünen.* Eng. *dunes* (q.v.) and *downs* (q.v.), it enters extensively into the names of places (becoming often *dum, don*), as D*un*kirk, D*um*barton *Don*egal. It is allied to the Ang.-Sax. *tun, ton,* whence *town* (q.v.).

DÜNA, *dü'nâ,* or DWINA, *dwē'nâ,* or DVINA, *dvē'nâ,* (known as the Western Duna in distinction from the Northern: see DWINA, NORTHERN): river of Russia which rises in the govt. of Tver, in the neighborhood of the source of the Volga, and flows w.s.w. in a course almost parallel to that of the Dnieper. At Vitebsk, the Düna turns to the w. then to the n.w., and advances in that direction toward its debouchure in the Gulf of Riga, passing the towns of Disna, Drissa, Dünaburg, Jacobstadt, and Riga; length about 650 m. It is navigable from Dünamunde, at its mouth, to Velij, on the border of the govt. of Smolensk. . 400 m.; but the navigation, owing to its shallows, its rock-obstructions, and sand-banks, is extremely difficult and dangerous, except during the spring and autumn floods. The basin of the Duna is estimated at 28,350 sq. m.; at Riga, its breadth is 2,400 ft. In the spring the surface of the Düna is covered with rafts and planks, floated down from the forests of the provinces through which it flows. Its waters, which abound in fish, are connected with those of the Dnieper by means of the Beresina canal, which thus connects the Black Sea and the Baltic.

DÜNABURG, *dü'nâ-bürċh:* strongly fortified town of w. Russia, on the Düna, in the govt. of Witebsk. It is of great military importance, owing to the strength of its fortifications, and was formerly cap. of Polish Livonia. It has three fairs in the year, and considerable trade. Pop. (1901) 72,231.

DUNBAR, *dŭn-bâr':* royal, parliamentary, and municipal burgh, and very ancient seaport and town in the n.e. of Haddingtonshire, Scotland; on an eminence at the mouth of the Firth of Forth, 29 m. e.n.e. of Edinburgh. Pop. (1901) 3,581. The coast is of basaltic rocks and islets, and

gives fine views of the Bass Rock, the Isle of May, and Fifeshire. Dunbar is a fine old town. It has a sail-cloth and cordage manufactory, a paper mill, and extensive tile-work, breweries, etc., but the chief industry is the fisheries, in connection with which are large curing establishments. The old harbor is impeded at the entrance by craggy islets and sunken rocks, but is accessible to vessels of 300 tons About 1840, an additional harbor, called the Victoria Harbor, was erected at Dunbar, at the expense of the Fishery Board and town; with recent important repairs and improvements, it has cost altogether upward of £50-000. It has four ft. depth at low water, and is considered one of the best suited for fishery purposes in the country. From 4,000 to 5,000 tons of herrings are annually exported from Dunbar, besides what are used for local consumption. The other exports are chiefly corn and potatoes. On the high rocks at the entrance to the new harbor are a few fragments of the ruins of a castle, which, from the end of the 11th c.. was the chief seat of the ancient Earls of March, and had great strength and importance as a security against English invasions; Edward I. took it, and Edward II. fled thither after the battle of Bannockburn; it was demolished 1333, and rebuilt 1336; it was successfully defended in a siege of six weeks against the Earl of Salisbury by Black Agnes, Countess of Dunbar, 1338; it sheltered Queen Mary and Bothwell 1567; and in the same year it was destroyed by the Regent Murray. In 1650, Cromwell, at the 'Race of Dunbar,' defeated the Scottish army under Leslie.

DUNBAR, *dŭn-bâr′*, WILLIAM: prob. abt. 1460—prob. abt. 1520: greatest of old Scottish poets. In 1475, he went to St. Andrews, where, 1477, he took the degree B.A., and 1479 M.A. Obscurity rests upon his career for about 20 years after he left the university. From his own writings we learn that he entered the order of St. Francis, and was employed as an itinerant or preaching friar. In that capacity, he 'ascended the pulpit at Dernton and Canterbury, and crossed the sea at Dover, and instructed the inhabitants of Picardy.' He appears to have entered the king's service, and to have been retained as 'clerk' or sec. to some of James's numerous embassies to foreign courts. In 1500, he obtained from the king a yearly pension of £10. In 1501, he visited England, in the train, as his biographers suppose, of the ambassadors sent thither to conclude negotiations for the king's marriage. 1503, May 9, three months before the queen's arrival, he composed, in honor of the event, his most famous poem, the *Thrissil and the Rois*. He seems then to have lived chiefly about court, writing poems and sustaining himself with hope of preferment in the church. 1504, Mar. 17, he received a gift for saying mass for the first time in the royal presence. At Martinmas, 1507, his pension was doubled and three years afterward it again received augmentation. He is supposed to have visited the n. parts of Scotland 1511, May, in the train of Queen Margaret. After the ruinous defeat at Flodden, and the confusion consequent on the king's

death and a prolonged regency, Dunbar's name disappears altogether.

As a poet, he had a wonderful variety of gifts; his genius comprised the excellences of many masters. He is at times as rich in fancy and color as Spenser in the *Faery Queen;* as homely and shrewd and coarse as Chaucer in the *Miller's Tale;* as pious and devotional as Cowper in his *Hymns;* and as wildly grotesque in satire as Burns in his *Death and Dr. Hornbook.* When Scott read portions of his works to Crabbe, in Edinburgh, the latter remarked that, 'before the Ayrshire plowman, Scotland possessed at least one great poet.' A careful edition of Dunbar's works, by Dr. David Laing, was published 1834; another by John Small, M.A., 1884; also a German one, with life, by Schipper (1884).

DUN-BIRD, n.: the pochard or poachard, *Fuligula ferina.*

DUNBLANE, *dŭn-blān':* city in the s. of Perthshire, Scotland, picturesquely situated on the left bank of the Allan, on the Scottish Central railway, 5 miles n. of Stirling. It takes its name from St. Blane, a bishop of the 7th or 8th c., said to have been born in Bute. It mainly consists of one street of old-fashioned houses. The cathedral of Dunblane, chiefly in the First-pointed or Early English style, about 1240, is now in ruins, except the choir, used as the parish church, 80 by 30 ft., with a tower 128 ft. high, the first four stages of which are Romanesque work of about 1140. The prebendary stalls of richly carved oak remain. Of the bishops of Dunblane, far the most celebrated was Robert Leighton, who held the see 1661–72, when he was translated to Glasgow. A path near the river, which he is said to have frequented, still bears the name of 'The Bishop's Walk;' and the library which he bequeathed to his diocese, is still kept in the town. Two m. from Dunblane was fought, 1715, the indecisive battle of Sheriffmuir, between the royal forces, under the Duke of Argyll, and the troops of the Pretender, under the Earl of Mar. Dunblane once had an ancient Culdee monastery. Pop. (1901) 2,516.

DUNCAN, *dŭnk'an,* Adam, Viscount: British admiral: 1731, July 1180—4, Aug. 4; b. Lundie, in Scotland. He entered the navy as midshipman 1746, became lieut. 1755, and in 1761 commander of the *Valiant,* which took part in the expedition to Havana under Admiral Keppel. In 1789 he was appointed Rear-Admiral of the Blue, and in 1793, Vice-Admiral of the Blue, but had little opportunity of distinguishing himself, and was even meditating, it is said, retiring altogether from the service, when he was appointed to the command of the united English and Russian squadron in the North Sea, with the special design of watching the movements of the Dutch fleet—Holland and France being then at war with England. Duncan's blockade of the Texel was one of the most effective ever made, and the Dutch trade was almost ruined. During the blockade, a mutiny took place among the seamen, and Duncan's position was for some time very critical, but the insubordina-

tion was ultimately quelled. Although weakened by the recall of the Russians, he gained a brilliant victory over the Dutch near Camperdown, 1797, Oct. 11, taking the Dutch admiral, De Winter, prisoner. Duncan was rewarded with a pension of £2,000, and raised to the peerage, with the title of viscount. In 1799, he was promoted to the rank of Admiral of the White.

DUN'CAN, THOMAS, R.S.A. and A.R.A.: 1807, May 24—1845, May 25; b. Kinclaven, Perthshire, Scotland. He studied in the Trustees' Acad., under Sir William Allan; was his successor as head-master of that school, and one of the most distinguished members of the Royal Scottish Academy. His portraits, and historical and fancy subjects, show delicate feeling, and keen appreciation of the humorous, with correct drawing and clear coloring. Though he exhibited but few pictures in the Royal Acad. of London, they attracted marked attention, and he was elected an assoc. of that body 1843. The principal works that he exhibited there were *Anne Page and Slender;* an illustration from the ballad of *Auld Robin Gray*, now in the Sheepshanks Gallery, South Kensington; *Prince Charles's Entry into Edinburgh after the Battle of Prestonpans*—and the same prince, when a fugitive, concealed in a cave. He had now entered on a most successful career, and was engaged on the studies for two important works: *Wishart Dispensing the Sacrament on the Day of his Martyrdom;* and a large picture for the Marquis of Breadalbane, *Queen Victoria at Taymouth*, when he was seized with an illness which terminated fatally at Edinburgh. One of his latest works was an excellent portrait of himself, now in the National Gallery of Scotland. Duncan's portraits, especially those of ladies and children, will always hold a high place. Among the historical and fancy subjects from him exhibited in the Royal Scottish Acad. were—1829, *The Death of Old Morality;* 1831, finished sketch of *Jeanie Deans and the Robbers;* 1835, *Mary Queen of Scots Compelled to Sign her Abdication;* 1836. *A Covenanter*, and *Old Mortality Renewing the Inscription on a Tombstone;* 1838, *The Secret Chamber—Isaac of York Visiting his Treasure;* 1846, the finished sketch of *Wishart Dispensing the Sacrament on the Day of his Martyrdom, March* 1, 1546.

DUNCANSBY HEAD, *dŭnk'anz-bĭ hĕd* (the *Berubium* of Ptolemy): promontory forming the n.e. extremity of Caithness, lat. 58° 39′ n., and long. 3° 1′ w., one mile and a half e. of John o'Groats's House. In the vicinity are deep long chasms or *ghoes*, in the Devonian strata, and curious detached sandstone columns in the sea called *stacks*. One of the chasms is 300 yards long, 12 to 15 wide, and 100 feet deep, and communicates with the sea by three openings, one of which is arched. The horizontal beds of the sides of the perpendicular gullies look like ruined walls.

DUNCE, n. *dŭns* [from *Duns Scotus* (q.v.). great leader of the schoolmen in the dark ages, opponents of the revival of learning; called after him *dunsmen* or *duncemen*]: one who is dull or weak in intellect; one slow at learning; a dolt.

DUNCISH, a. *dŭns'ish*, like a dunce. DUNCE'DOM, n. the realm or domain of dunces.

DUNCH, v. *dŭnsh*, or DUNT, v. *dŭnt* [Dan. *dundse*, to thump: L. *tundĕrĕ*, to beat, to strike: Let. *dunksch*, the sound of a blow with the fist]: in *Scot.* and *OE.*, to push or jog with the fist or elbow; to give a nudge: N. a. push or jog; a nudge. DUNCH'ING, imp. DUNCHED, pp. *dŭnsht*. DUN'TING, imp. DUNTED, pp. *dŭn'tĕd*.

DUNCIAD, *dŭns'ĭ-ad*, THE, by Alexander Pope: published 1728, in three books; to which a fourth was added 1742. Pope had been, during the greater part of his career, afflicted by a host of critics and detractors. His own genius had not been spared; the worst motives, personal and literary, had been imputed to him; and he resolved to mete unto his enemies the measure which had been meted unto himself. Hence the origin of *The Dunciad*. Never was chastisement more complete. On its publication, a general howl of rage and pain arose. The satire conferred immortality on his opponents. Pope was a good hater, and his hatred and contempt defy the tooth of Time more completely than all the preservative balsams of the Pharaohs.

DUNCOMBE, *dŭn'kum*, THOMAS SLINGSBY: 1796–1861, Nov. 13: English politician. He was elected M.P. for Hertford in 1824, assisted in carrying the reform bill, and became prominent in the extreme liberal party. In 1834 he was returned for Finsbury, which seat he retained in the parliament which assembled 1859. In 1842, he presented the Chartist petition, signed by 3,000,000 of the lower classes in favor of universal suffrage, vote by ballot, short parliaments, etc. In 1842, the then home sec., Sir James Graham, having sanctioned the opening of the letters of Mazzini, Duncombe in the house of commons denounced, with scathing invective, the adoption of the post-office spy-system on English soil. He was an earnest advocate of Jewish emancipation; and his motion, 1858, for placing Baron Lionel Rothschild on a committee of the house of commons, was soon followed by the concession, by the latter chamber, of the right of Jewish members to sit in the house of commons.

DUNDALK, *dŭn-dawk'*: municipal borough and seaport, cap. of Louth county, Ireland; beautifully situated at the mouth of the Castleton river, 50 m. n. of Dublin. It is overlooked on the n.e. by the Carlingford Mountains. Vessels drawing 16 ft. can enter the harbor. Dundalk has manufactures of tobacco, soap, leather, starch, and salts; steam flour-mills; considerable fisheries; a distillery, brewery, and a flax-spinning mill. The chief imports, especially from Liverpool, are groceries, timber, coal, iron, slates; and the exports, flax, linen, and all sorts of agricultural and dairy products and live stock. Dundalk is the chief outlet for the produce of the counties of Louth, Monaghan, and Cavan. It has the remains of a Franciscan friary, and a Druid's circle. The last king of all Ireland

was crowned here. Edward Bruce took Dundalk 1315, and held his court here till killed in battle at Faughart, in the vicinity, 1318. Dundalk was captured by the Irish 1641, by Cromwell 1649, and by Schomberg 1689. In 1879–80 the annual value of property was £20,133; the harbor revenue was £9,246. Pop. (1901) 13,067.

DUNDALK BAY is eight m. by seven, with four to six fathoms water in the middle. It receives the Fane, Dee, and Castleton rivers.

DUNDAS′ island belonging to Great Britain, on the n.w. coast of America, 40 m. n.e. of Queen Charlotte Island. It has Dixon's Entrance (q.v.) on the w., and is separated by Chatham Sound from the most southerly of the Alaskian islands.

DUNDAS: group of nearly 500 islets, all of coralline formation, off the e. coast of Africa, about lat. 1° s. There is only one secure harbor.—An African river named Dundas, flows into Delagoa Bay (q.v.).

DUNDAS: strait in n. Australia, separating Melville Island from Coburg Peninsula, 18 m. in breadth.

DUNDAS: town in the province of Ontario, Dominion of Canada, at the head of Burlington Bay, at the w. of Lake Ontario. Pop. 3,546.

DUNDAS, *dŭn-dăs′:* castle and manor on the s. bank of the Firth of Forth. near s. Queensferry; the castle is a square tower of the 15th c. ,with modern additions; the manor was the original seat of the distinguished family of Dundas, to whose progenitor it was granted by the Earl of March about 1150.

DUNDAS′ (of ARNISTON): Scottish family singularly distinguished for legal and political talent.

Sir JAMES DUNDAS, the first of Arniston, received knighthood from James VI., and was gov. of Berwick. His son, Sir JAMES DUNDAS, was appointed a judge of the court of session 1662, and took his seat on the bench under the title of Lord Arniston, but was soon deprived of office for refusing to abjure the 'National and Solemn League and Covenant.' He died 1679; and his eldest son, Sir ROBERT DUNDAS, who also rose to the bench, died 1727.

ROBERT DUNDAS, 1685–1753, son of Sir Robert, in 1717 was appointed solicitor-gen. for Scotland; in 1720 lord advocate; and in 1722 was chosen to represent the county of Edinburgh in the British parliament. In 1725, Dundas resigned his seat, and 1737, he was raised to the bench, when, like his father and grandfather , he took the title of Lord Arniston. He was appointed lord president 1748. As an advocate he was a powerful and ingenious reasoner, and though somewhat disliked on the bench, his ability was universally admitted.

ROBERT DUNDAS, 1713, July 18—1787, Dec. 13: eldest son of Robert; studied at Edinburgh and Utrecht, was admitted to the Scottish bar 1738, and rose to be lord advocate (1754) and pres. of the court of session (1756).

DUNDAS', the Right Honorable Henry, Viscount Melville, and Baron Dunira: 1741–1811, May 27; younger son of Robert (1685–1753). He was educated at the Univ. of Edinburgh, and admitted to the Scottish bar 1763. He was successively appointed depute-advocate and solicitor general; in 1774, was returned to parliament for the county of Edinburgh, and 1775 was appointed lord advocate for Scotland. Two years later he was made keeper of the king's signet for Scotland. In parliament Dundas unexpectedly allied himself with the party in power and became a strenuous supporter of Lord North's administration, and one of the most obstinate defenders of the war with the American colonists; but when the coalition ministry was formed by Fox and Lord North, he passed over to the side of his old opponent, and became Pitt's ablest coadjutor. When Pitt returned to the helm of the state 1784, Dundas was appointed pres. of the board of control. In 1791, he was appointed principal sec. of state for the home department. He also held a great number of other offices. Dundas's aptitude for business was undeniable, and many important public measures originated with or were directly promoted by him. When Pitt resigned 1801, Dundas did the same. In 1802, under the administration of Mr. Addington, he was elevated to the peerage. In 1806, he was acquitted of charges of 'gross malversation and breach of duty,' while acting as treasurer of the navy. After this, however, he took little part in public affairs. He died at Edinburgh.

DUNDEE, *dŭn-dē'* (Lat. *Taodunum*, the 'hill or fort on the Tay'): royal, parliamentary, and municipal burgh and seaport in the s. of Forfarshire, Scotland, on the left bank of the estuary of the Tay, here two m. broad, 10 m. from the entrance of that river into the sea, 50 m. n.n.e. of Edinburgh, 20 e.n.e. of Perth, 14 s.e. of Forfar. In population, it is the third town in Scotland. It stands mostly on the slope between Dundee Law (571 ft. high, composed of trap, and with traces of ancient vitrification) and Balgay Hill and the Tay. The new streets are wide and well laid out. The most striking architectural features of the town are—the Town Hall, in the Roman Ionic style, with a spire 140 ft. high, erected by the 'Elder Adam,' 1734; the Albert Institute and Free Library, in 15th c. Gothic, from designs by Sir Gilbert Scott, erected (1865–74) at a cost of £30,000; the Royal Exchange, in the Flemish pointed style of the 15th c., at a cost of upward of £12,000; the Eastern Club House; the Corn Exchange, capable of containing 2,000 people; the Infirmary; the Justiciary and Sheriff Court Buildings; the Post-office; the High School; the Town's Churches with the old tower, 156 ft high; St. Paul's Episc. Church; St. Paul's and St. Enoch's Free Churches; the Morgan Hospital for the maintenance and education of 100 boys; and the new Orphan Hospital. Dundee Univ. College, instituted by Miss Baxter, for both sexes, was opened 1883. It began with a clear endowment of £100,000, and a staff of five professors, and had over 350

students in its first session. Its scheme includes evening classes for those unable to enter on a systematic course of training during the day. Dundee has several public parks. Dundee is the chief seat in Great Britain of the manufacture of coarse linen fabrics (Osnaburgs, sheetings, ducks, dowlas, drills, canvas, and cordage). Manufactures of jute are carried on almost exclusively here. The consumption in Dundee of this material, which is grown in India, amounts to fully 300,000 tons annually. The raw material costs in Dundee less than 4c. per lb.: and the cloth made from it, reckoned by weight, is the cheapest textile fabric made in Great Britain. Of jute many varieties of fabric are made, from the coarsest nail-bagging to carpets of great beauty. This range includes pack-sheets for every species of merchandise, sacks for wool, coffee, guano, etc. The annual value of the flax, hemp, and jute manufactures in Dundee is upward of £5,500,000. Dundee is famous for its manufacture of confectionery, which is exported to all parts of the world. One firm used 150 tons of bitter oranges annually in the manufacture of marmalade. Dundee is the centre of the whale and seal fishing trade of Great Britain. Shipbuilding (both wood and iron) and machine making are carried on to some extent. Dundee has magnificent harbors, in addition to the tide harbor, several large wet docks, a graving-dock, and a slip for large vessels. The docks have been erected at a cost of upward of £700,000. The direct railway communication of Dundee with the south, established 1878 by the Tay bridge, two m. long, was interrupted by a sad disaster at the end of 1879, when a great part of the bridge and a passenger train passing over it were thrown into the river. Steps were soon taken to have the bridge rebuilt at a somewhat lower elevation. Dundee sends two members to parliament. It was an important place in the 12th c. Edward I. was here twice. Wallace is said to have taken the castle 1297, and Bruce demolished it 1313. The duke of Lancaster burned Dundee 1385, and the Marquis of Montrose pillaged it 1645. Charles II. lived here, after his coronation at Scone, 1650. On the refusal of Dundee to submit to Cromwell, General Monk, 1651, sacked and burned it, massacring 1,000 citizens and soldiers, and filling 60 vessels with booty, which were wrecked on their voyage to Eng. Dundee was one of the first Scotch towns to adopt Reformation. Wishart the martyr preached here during the plague of 1544. Pop. (1901) 160,871.

DUNDEE, Viscount: see Graham, John.

DUNDER, n. *dŭn′dėr* [Sp. *redundar*, to overflow]: the lees or dregs of cane-juice, used in the distillation of rum.

DUNDERHEAD, n. *dŭn′dėr-hĕd* [Sw. *dunser*, a heavy-footed man]: a stupid fellow; a dunce. Dunder-headed, thick-headed; stupid.

DUNDONALD, *dŭn-dŏn′ald*, Thomas Cochrane, Earl of: 1775, Dec. 14—1860, Oct. 31; son of the ninth Earl of

Dundonald. He, while still a boy, entered the 104th regiment. At the age of 17, he joined the *Hind* corvette, commanded by his uncle, Capt. Sir Alexander Cochrane. In 1800, he became master and commander of the *Speedy* sloop-of-war, 14 guns and 54 men; and in ten months he took 33 vessels, carrying together 128 guns and 533 men, besides assisting in the capture of many others. Dundonald received his post-rank, 1801, for the capture, by boarding, of *El Gamo*, a Spanish frigate of 32 guns, off Barcelona. In 1803, he was appointed to the *Arab*, 22, and served at the blockade of Boulogne. In 1804, he removed to the *Pallas* frigate 32, and was sent out to assist his uncle in the blockade of Ferrol. He made several valuable prizes while cruising off the Spanish coast, among others the *Fortuna*, with specie to the amount of £150,000, besides merchandise, but generously returned 10,000 crowns to the Spanish captain and supercargo. In 1806, he cut out the *Tapageuse* corvette, which lay in the Gironde, under the protection of two heavy batteries. He destroyed the semaphores along the French coast, and carried by storm the battery at Pointe l'Equilon, which he blew up. Being now transferred to *L'Impérieuse*, he took and destroyed, in the month ending 1807, Jan. 7, 15 of the enemy's ships, chiefly laden with wine and provisions. He was next sent to co-operate with the patriots on the coast of Catalonia, and contributed to the surrender of the castle of Mongat. After harassing the French coast, and destroying the semaphores on the coast of Languedoc, he volunteered for the defense of Fort Trinidad, at Rosas, on the coast of Catalonia. At the head of 80 of his own men, and the same number of Spaniards, he repelled 1,000 of the enemy in an assault made by them upon the castle. He protracted the siege for 12 days, then blew up the magazine, and returned to his ship. In 1809, April, he was selected by the Admiralty for the daring and hazardous service of burning the French fleet then lying at anchor, and blockaded by Lord Gambier, in the Basque Roads. At night he went on board one of the fireships, containing 1,500 barrels of gunpowder, and performed the service intrusted to him with characteristic intrepidity. He was rewarded with the knighthood of the Bath. He had been chosen M.P. for Westminster 1807; and his charges of incompetency against Lord Gambier led to a court-martial upon that nobleman. Lord Gambier, after a partial trial, was acquitted, and the professional prospects of his assailant were ruined. During the rest of the war, the country lost the incalculable benefit of his services at sea. Early in 1814, he was accused of complicity in fraudulent stock-jobbing transactions. A rumor of the downfall of Napoleon having caused a sudden rise in the funds, Dundonald and his friends were charged with having fraudulently propagated the rumor, and with having 'sold out' to a large amount. He was found guilty of fraud, and was sentenced to pay a fine of £1,000, to suffer a year's imprisonment, and to stand in the pillory. The latter part

of the punishment was remitted, but he was deprived of the order of the Bath, of his rank in the navy, and expelled from the house of commons. A new writ was issued for Westminster; but his constituents immediately re-elected him, notwithstanding his expulsion from the house; and his daring was shown by his escape from prison, and his re-appearance in the house. He represented Westminster until 1818, when, panting for a more active and eventful career, he drew his sword in defense of the independence of the S. American colonies of Spain. The command of the fleet of the republic of Chili was offered to him, and the terror of his name materially contributed to the success of the national cause. Valdivia, last stronghold of the Spaniards, was captured by him. Another daring exploit was the cutting out of a large 40-gun frigate from under the guns of the castle of Callao, 1820, Nov. 5. The emperor of Brazil, Dom Pedro, afterward gave him the command of the Brazilian fleet, and created him a marquis. In 1827 and 1828, he assisted in the Greek war of independence. In 1830, the Whig administration of Earl Grey came into office, and, believing him to have been the victim of a cruel and unjust persecution, hastened to restore him his naval rank. In 1831 he succeeded to the earldom. In 1847, Queen Victoria conferred on him the grand cross of the Bath. He was also appointed commander-in-chief on the N. American and W. India station. In 1851 he was vice-admiral of the White, and in 1854, rear-admiral of the United Kingdom, a distinction which he held until his death. On his retirement from active service, he applied himself to scientific inventions. He turned his attention especially to naval projectiles. He declared himself to be in possession of a means of annihilating an enemy's fleet, and during the Russian war offered to destroy Sebastopol in a few hours with perfect security to the assailants. His plans were, however, rejected. When upward of 80 years of age, he published his Autobiography—the record of a career almost unequalled even by British seamen for desperate service and dauntless exploit. His burial was in Westminster Abbey. In his naval expeditions, it was his fate to be constantly opposed to forces greatly superior to his own in numbers and metal. His inventiveness and fertility of resource under such circumstances have perhaps never been equalled. His daring would have been, in a man of less genius, the height of rashness, yet the almost unvarying success of his maneuvers and exploits attests his forethought, and his happy adaptation of slender means to great enterprises. In person, he was tall and broad built, and of commanding stature, though with a slight stoop, contracted by service in the small sloops and corvettes of his early days. His features were Scottish in character, and strongly marked, bearing in deep lines the traces of struggle, sorrow, and the wear and tear of an unusually long, active, and eventful life. In 1877 a petition was presented to the queen, asking compensation to Dundonald's heirs for his 18

years' loss of pay and allowances as a naval officer—which was ultimately granted.

DUN-DRIVER, n. (*Mergus merganser*, or *castor*): the goosander (q.v.). See also MERGANSER.

DUNDRUM BAY, *dŭn'drŭm:* inlet of the Irish Sea, on the e. coast of Ireland, county Down, 5 m. s. of Downpatrick. It is about 10 m. wide at its entrance, and forms a long curve into the shore, with a uniform breadth of about 2½ miles.

DUNE, n. *dūn* [Celtic, *dun*, a hill, a fortified place: F. *dune*, a sandhill]: a low hill of moving sand on the coast; a rude circular building with conical roof; a mound; a kind of rude fortification—also spelled DUN. DUNES [see DUN, verbal root]: the sand-hills or mounds which stretch less or more along the sea-coast of the Netherlands and n. of France. These Dunes are a natural curiosity. 'As if anxious to save the low countries from tidal inundation, Nature has for centuries been energetically working to increase the magnitude of the mounds on the coast. At low water, when the beach is exposed to the action of the winds from the German Ocean, clouds of sand are raised into the air, and showered down upon the country for at least a mile inland; and this constantly going on, the result is, that along the whole line, from Haarlem to about Dunkirk or Calais, the coast consists of sandy mounds of great breadth, partially covered with grass and heath, but unfit for pasturage or any other purpose, and these are the bulwarks which protect the coast. In some places these dunes look like a series of irregular hills, so high that they shut out the view of the sea even from the tops of the steeples. The traveller, in visiting them from the fertile plains, all at once ascends into a region of desert barrenness. He walks on and on for miles in a wilderness such as might be expected in Africa, and at last emerges on the sea-shore, where the mode of creation of this singular kind of territory is at once evident. Loose particles of sand are blown in his face; and as he descends to the shore, he sinks to the ankle in the drifted heaps. In some parts of these dreary solitudes, the sandy soil has been prevented from rising with the wind and injuring the fertile country, by being sown with the seeds of a kind of bent grass, and in a few spots fir-trees have been successfully planted.'—*Tour in Holland*, by W. Chambers. The English term *down* (q.v.) has a similar meaning: see also DRIFT-SAND.

DUNEDIN, *dŭn-ĕd'ĭn;* capital of the provincial dist. of Otago, in New Zealand, lat. 45° 50′ s., long. 170° 36′ e., on the e. side of South Island, toward its s. extremity. It is 200 m. by sea from Lyttleton, and 150 m. from Invercargill. Since its foundation by the New Zealand Company, 1848, the city has rapidly increased in importance; chiefly after 1861, when the discovery of extensive gold fields in the neighborhood caused sudden increase of population. For three years, the city, as well as the province, made great

strides in wealth and prosperity; and though subsequently the excessive increase of population was checked by a decrease in the yield of gold, Dunedin has made steady progress. Within the last few years, the population has been increased by immigration from the colony of Victoria. Dunedin is divided into four wards. It is as well laid out as the hilly nature of its site will allow; it is well paved, and lighted with gas. There are many handsome buildings—about a dozen of them churches; the new bank of New Zealand, completed 1882, is one of the finest in the city. Dunedin is the seat of an Angelican and a Rom. Cath. bishop. Other public buildings are the post-office, hospital, government buildings, mechanics' institute, etc.; and the inhabitants of the city possess places of recreation in the Vauxhall Gardens, Botanical Gardens, and the grounds of the Acclimatization Society. The univ. and high school are flourishing institutions. There are several daily papers, and numerous weeklies and monthlies. Among the manufactories, a woolen one is the principal. The street tramways are worked by locomotives. Railways connect Dunedin with Christchurch to the north and Ivercargill to the south. Dunedin, which is the most important commercial city in New Zealand, has frequent communication with the other colonial ports, with Melbourne and Britain. Pop. (1901) 24,879, or with suburbs, 52,390.

DUNFERMLINE, *dŭn-fĕrm'lĭn* or *dŭm-fer'lĭn:* royal burgh in Fife, Scotland, of the w. district, of which it is the chief town. The town is on a long swelling ridge, 3 m. from the Firth of Forth, 16 m. w.n.w. from Edinburgh. It stands 300 ft. above the mean level of the firth, and from the s. has an imposing appearance. The date of its origin is not known, but it was a place of note before the end of the 11th c. Here King Malcolm Canmore and his queen, St. Margaret, between 1070 and '93, founded an abbey for Benedictines brought from Canterbury. In 1303–4, Edward I. of England wintered here, the buildings being then described as capable of accommodating three kings and their suites. In 1588, Dunfermline was created a royal burgh by James VI. David II., James I. of Scotland, and Charles I. were born here. and Malcolm Canmore, his queen Margaret, Edgar, Alexander, I., David I., Malcolm the Maiden, Alexander III., Robert Bruce, his queen Elizabeth, and nephew Randolph, Annabella, queen of Robert III., Robert Duke of Albany, gov. of Scotland, were buried in the abbey and its precincts. The tomb of Robert the Bruce was discovered at the building of the new church, which was opened 1821. The skeleton of the king was disinterred and a cast was taken of the cranium. Some interesting fragments of the ancient regal and ecclesiastical magnificence of Dunfermline remain. What is called Malcolm Canmore's Tower is a mass of shapeless ruins, but the s. wall of the palace of the Stuarts is still seen overhanging the romantic glen of Pittencrieff, a noble wreck, with massive flying buttresses. Of the abbey, the Frater Hall or refectory, and a tower and arched gateway remain.

The nave of the abbey church, consecrated 1150, is in the Romanesque style, 106 ft. long and 55 ft. wide. The choir, built about 1250, a fine example of the first Pointed style, was taken down 1818–21, when it was replaced by what is now the parish church, surmounted by a square tower 100 ft. high, round which is the inscription in open hewn capital letters, 'King Robert the Bruce.' The modern history of Dunfermline is notable in connection with the rise of the Scottish dissent, Ralph Erskine and Thomas Gillespie having respectively been founders of the Seceder and Relief bodies, now joined under the name of United Presbyterians. The staple trade of the town is damask linen-weaving, which took its rise about the beginning of the last century. See DAMASK. There are establishments for the spinning of linen yarn, and several large factories where steam and handloom weaving is carried on. There are likewise large collieries, and lime-works, iron foundries, breweries, dye-works, and fire-clay works. The public buildings are—town-house and county buildings, each having a spire, and the prison, poor-house, and music hall. There are eight fairs, a monthly cattle-market, and one weekly market for grain or country produce. Pop. (1901) 25,250.

DUN-FLY, n.: species of artificial fly used in angling.

DUNG, n. *dŭng* [Dan. *dygge*, to sprinkle with water; prov. Dan. *dung*, wet through: Sw. *dynga*, muck: Ger. *dung*, manure; *düngen*, to manure]: the refuse or filth from animals; excrement; anything filthy or rotten: V. to manure with dung. DUNG'ING, imp. DUNGED, pp. *dŭngd*. DUNGY, a. *dŭng'ĭ*, filthy; full of dung. DUNGHILL, a heap of dung; a dirty, vile abode: ADJ. sprung from the dunghill; base mean. DUNG-MEER, n. a pit where dung, weeds, etc., are mixed to lie and rot together.

DUNGANNON, *dŭn-găn'on:* parliamentary and municipal borough in the e. of Tryone, Ireland, near a tributary of the Blackwater, 11 m. n.n.w. of Armagh, 8 m. w. of Lough Neagh. It lies on a hill slope, in a densely peopled district, with high mountains to the west. It is well built and consists of a square with diverging streets. In the vicinity are the largest lime-quarries and collieries in Ulster. The chief manufactures are linen, earthenware, and fire-brick. It sent a member to parliament till 1885. It was the chief seat of the O'Neils, the kings of Ulster, till 1607. Its castle was destroyed by the parliamentary forces 1641. Pop. (1901) 3,700.

DUNGARVAN, *dŭn-gâr'van:* parliamentary and municipal borough, seaport, and bathing-place, Waterford county, Ireland, 25 m. w.s.w. of Waterford. The people are engaged chiefly in hake, cod, herring, and other fisheries. The chief exports are grain, butter, cattle, and fish. Vessels of more than 250 tons cannot discharge at the quay. Dungarvan has the remains of an Augustinian abbey, founded in the 7th c. by St. Garvan, and the remains of walls built by King John, who also built the castle, now used as barracks. Pop. (1901) 5,000.

DUNGARVAN BAY is 3 m. wide, about the same in length, and one to five fathoms deep.

DUNG BEETLE: common name of many coleopterous insects of the fam. *Scarabæidæ*, which feed upon the dung of animals, and for the most part live in it. They are found in all parts of the world. Many of them belong to the section of *Scarabæides* called *Coprohagi* (Gr. dung-eaters) but others, as the DOR, or SHARD-BORN BEETLE (*Geotrupes stercorarius*), to the section called *Arenicoli* (Lat. sand-dwelling), distinguished by peculiarities in the antennæ, mandibles, etc. Neither section, however, consists exclusively of insects entitled from their habits to be called dung-beetles, some of the *Coprophagi* feeding chiefly on marine vegetables in a state of putrescence, and some of the *Arenicoli* on the roots of plants. The DOR is one of the most common British beetles; it is of a stout form, less than an inch long; black, with brilliant metallic and blue reflections on the under surface; it may often be heard droning through the air toward the close of the summer twilight, and finds its way with rapidity and certainty to cow-dung, on which it feeds, and under which it burrows, making a large cylindrical hole, often of considerable depth, and depositing therein its eggs, enveloped in a mass of dung. These habits—more or less modified—are shared by many other species, which thus not only hasten the removal of what would otherwise become offensive on the surface of the ground, but even distribute it in the soil, where it affords nourishment to plants. The sacred beetle or Scarabæus (q.v.) of the Egyptians (*Scarabæus sacer*, or *Ateuchus sacer* of modern entomologists is a true dung-beetle, one of the *Coprophagi*, in size and color much resembling the dor. It is found not only in Egypt, but in the s. of Europe and the w. of Asia, and deposits its eggs in dung, which it rolls into little balls for the purpose. A nearly allied insect (*Gymnoplurus pilularius*) a native of N. America, is known as the TUMBLE-DUNG BEETLE, from its habit of rolling globular pellets of dung to the place where they are to be buried in the earth. Several individuals sometimes combine their strength in this curious operation, which is performed by the hind feet pushing backward.—The dor, and some other dung beetles, simulate death to deceive their enemies when they apprehend danger, not, like many insects, by contracting their bodies as much as possible, and drawing in their legs, but by stretching every part out to the utmost, and rigidly fixing themselves in that position. Crows and other birds are supposed to prefer them in a living state.

DUNGEON, n. *dŭn′jŭn* [F. *donjon*, the large tower of a fortress—from mid. L. *dominĭōnem*, *domgĭōnem*, or *dongĕōnem*, a tower, a work of defense—from *dŏmŭs*, a house: comp. Gael. *dundion*, the hill or fort of security—from *dun*, hill; *dion*, shelter]: originally the large and strongest tower of a fortress, to which the garrison could retreat in case of necessity, the lower apartments of such being used as prisons; a close dark prison, commonly underground; any deep

dark place. DUN'GEONED, pp. a. *-jŭnd*, confined in a dungeon. See DONJON.

DUNGIYAH, n. *dôn-gē'ya* [Arab.]: in *naut.*, a species of vessel employed in the coasting trade on the shores of Arabia, etc. It has one long mast.

DUNGLISON, *dŭng'glĭ-son*, ROBLEY, M.D., LL,D.: 1798, Jan. 4—1869, Apr. 1; b. Keswick, England: med. prof. and author. He studied medicine in London and Erlangen, Germany, received his degree at the latter city 1823, was appointed prof. of medicine in the Univ. of Va. 1824 served there till 1833, was prof. of materia medica and therapeutics in the Univ. of Md. 1833–36, and of the institutes of medicine in the Jefferson Med. College, Philadelphia, 1836–68. He translated and edited a number of foreign medical works, and published about 20 original vols., among which the best known are—*Principles of Human Physiology* (1832), *New Dictionary of Medical Science and Literature* (1833), revised and republished as *A Dictionary of Medical Science* (1865), *Elements of Hygiene* (1835), *General Therapeutics* (1836), and *Practice of Medicine* (1842).

DUNKARDS, or DUNKERS: see TUNKERS.

DUNKELD, *dŭn-kĕld'* or *dŭn-kĕl':* city and burgh of barony in the east of Perthshire, Scotland, 15 m. n.n.w. of Perth. It lies in a deep romantic hollow on the great e. pass (of Birnam) to the Highlands, on the left bank of the Tay, across which it communicates with the south by a handsome bridge, built 1809 by the Duke of Athole. It is environed by dark-wooded and craggy mountains. Dunkeld is a place of great antiquity, dating probably from the 7th or 8th c. About 1130, King David I. made it the seat of a bishopric, of which the Culdees of the ancient abbey were the chapter. The choir of the cathedral, chiefly in the First Pointed style, was built between 1318 and '37; the nave, in the second Pointed style, between 1406 and '64; and the tower and chapter-house, also in the Second Pointed style, between 1470 and '77. The choir is now the parish church. The monument of the Wolf of Badenoch (Alexander Stuart, Earl of Buchan, died 1384) lies in the vestibule. The Duke of Athol's grounds, unsurpassed in Scotland for extent and beauty, lie w. and n. of Dunkeld and include the cathedral; Craig-vinean and Craig-y-Barns; 50 m. of walks, and 30 m. of drives; falls of the Bran and 20 sq. m. of larch-wood, including the first two larches planted in Britain (1737). Dunkeld, in ancient times, is said to have been the seat of the Pictish kings. Three m. south of Dunkeld stood Birnam Wood, famous in connection with the fate of Macbeth. Pop. (1901) 700.

DUNKIRK, *dŭn'kĕrk*, New York: city in Chautauqua co., on Lake Erie; and on the Erie, the Nickel Plate, the Lake Shore, the Western N. Y. & P., the Dunkirk, the Alleghany Valley, and P. railroads, 40 m. s.w. of Buffalo. It has a commodious harbor rendered especially safe for the

locality by a breakwater, and several lines of steamboats and sailing vessels connect it with the other lake ports. Its industries embrace extensive locomotive works and machine shops, foundry, planing-mills, grain-mills, grain and coal elevators, and factories of various kinds. It is a popular summer resort where many visitors assemble during the heated term to enjoy the lake breezes and the bathing. There is a fine park overlooking Lake Erie, and the city has a public library, orphan asylum, public and parish schools, a national bank, etc. There are a number of churches, representing all the leading denominations, a monastery, an opera house, public hall, several graded schools and newspapers. Water is supplied by the Holly system. The city is lighted by gas and electricity. Pop. (1910) 17,221.

DUNKIRK, *dŭn'kĕrk*, or DUNKERQUE, *dŭng-kärk'*: most northerly seaport and fortified town of France; on the e. shore of the Strait of Dover, in the dept. of Nord, distance from Paris in a direct line about 155 m. n., and from Lille about 43 m. n.w. The town, which is connected by railway and canal with the principal manufacturing centres of Belgium and France, is surrounded by ramparts and ditches, and is defended by a citadel. It is well built, the streets spacious and well paved, the houses chiefly of brick. Its quay and pier, its church of St. Eloi —a Gothic structure, having a handsome though incongruous frontispiece in its Corinthian portico—its town-hall, barracks, college, and theatre, are the principal architectural features. The harbor of Dunkirk is shallow, and the entrance difficult, but the roadstead is large and safe. Dunkirk has manufactures of soap, starch, beer, beetroot-sugar, cordage, and leather; also metal foundries, distilleries, salt-refineries, and ship-building yards. Forming as it does the outlet for the great manufacturing dept. of Nord, its trade by sea is considerable. Since becoming a free port, it has carried on a good trade in wine and liqueurs. Its cod and herring fisheries are actively prosecuted. The immediate vicinity of Dunkirk has a dreary and uninteresting appearance.

Dunkirk is a place of historic interest. It owes its origin it is said, to the church built by St. Eloi in the 7th c., in the midst of a waste of sand-hills or dunes, and hence its name, 'Church of the Dunes.' Dunkirk was burned by the English 1388, taken by them under Oliver Cromwell in 1658, but sold to Louis XIV. by Charles II. 1662. By the treaty of Utrecht, 1715, the French were compelled to destroy the fortifications of Dunkirk, which were restored, however, 1783. In 1793, the allies under the Duke of York laid siege to Dunkirk, but were compelled by the French to retire, after suffering severely. Dunkirk was made a free port 1826. Pop. (1901) 40,329.

DUNLIN, n. *dŭn'lĭn* [AS. *dune*, a sand heap; Gael. *linne*, a pool or lake]: called also PURRE (*Tringa alpina*, *T. cinclus*, or *T. variabilis*): bird of the family *Scolopacidæ* (snipes, etc.), and of the large group to which the names

sandpiper and stint are variously given. It is not quite nine inches in length from the extremity of the bill to that of the tail. The plumage undergoes great variations in summer and winter. It is very widely diffused. In summer, it frequents even the desolate shores of Melville Island. It is seen in autumn and winter on the shores of Britain and of most parts of Europe; often in vast flocks on sandy or muddy sea-shores; and is equally common on those of America, northerly, where it is the larger var. *Pacifica*, and is known as Ox-bird, and Red-backed Sandpiper, being chestnut-brown above, black-streaked. 'When flying in great autumnal flocks, its aërial movements are extremely beautiful, each individual of the vast assemblage yielding so instantaneously to the same impulsion as to exhibit alternately the upper and the under surface of the body, so that we have for a time a living, moving cloud of dusky brown, and then a brilliant flash of snowy whiteness.'

DUNLOP, n. *dŭn'lŏp:* the name of a parish in Ayrshire and Renfrewshire, in Scotland; a kind of rich, white cheese made in Scotland of unskimmed milk.

DUNMORE, *dŭn-mōr':* town, Lackawanna co., Penn., 3 m. e. of Scranton, 12 m. n.e. of Pittston, on Delaware Lack. and West., and the Penn. Coal Co.'s R. Rs. It is in the great anthracite coal region of the Lackawanna valley, is an important shipping point of the coal industry, and has several churches and graded public schools. Pop. (1900) 12,583; (1910) 17,615.

DUN'MOW FLITCH OF BACON: prize instituted at Dunmow, in Essex, England, 1244, by Robert de Fitzwalter, on the following conditions: 'That whatever married couple will go to the priory, and kneeling on two sharp-pointed stones, will swear that they have not quarrelled nor repented of their marriage within a year and a day after its celebration, shall receive a flitch of bacon.' The prize was first claimed 1445, two hundred years after it had been instituted. After 1751, up to which date only five presentations had taken place, the flitch was not again claimed till 1855. The tenth occasion of awarding the flitch occurred in 1876.

DUNNAGE, n. *dŭn'nāj* [probably Gael. *dun*, a mound, a hill; or Manx, *doon*, to close, to darken]: loose miscellaneous substances such as boughs, wood, old mats or sails laid on the bottom of a ship as a bed for heavy goods.

DUNNE, Finley Peter, American journalist and humorist: b. Chicago, 1867, July 10. He was educated in the Chicago public schools and entered journalism in 1885. He was city editor of the Chicago *Times* 1891-2; was on the editorial staff of the Chicago *Evening Post* and *Times-Herald* 1892-7; and editor of the Chicago *Journal* 1897-1900. He is author of *Mr. Dooley in Peace and War* (1898); *Mr. Dooley in the Hearts of His Countrymen* (1898); *Mr. Dooley's Philosophy* (1900); *Mr. Dooley's Opinions.*

DUNNED, DUNNING, DUNNISH: see under DUN 1 and 2.

DUNNET HEAD, *dŭn'nĕt hĕd:* rocky peninsula, 100 to 600 ft. high, most northerly point of Scotland, on the n. coast of Caithness; lat. 58° 40′ n., and long. 3° 21′ w. It consists of upper old red sandstone, resting on the middle flagstone of the same system. It is frequented by various species of sea-fowl, among which is the puffin.

DUNNING, n. *dŭn'nĭng* [from *dun*, of a dark-brown color]: in *Amer.*, a particular method of curing codfish.

DUNNING, WILLIAM ARCHIBALD, American educator: b. Plainfield, N. J. He was graduated at Columbia 1881, and became successively fellow 1886-8; prize lecturer in political science 1887-9; instructor in history 1889-91; and professor of history and lecturer on political theory since 1891. In 1894 he became managing editor of the *Political Science Quarterly*, to which he has contributed over 60 important articles and reviews. He has published: *Essays on the Civil War and Reconstruction, and Related Topics* (1898); *History of Political Theories, Ancient and Mediæval* (1902); *History of Political Theories* (1902).

DUN'NOCK: See HEDGE-SPARROW.

DUNNOTTAR CASTLE, *dŭn-nŏt'tĕr:* ancient seat, now in ruins, of the Keiths, Earls Marischal of Scotland, on the Kincardineshire coast, a mile and a half s. of Stonehaven. It occupies the top of the rock 3 acres in extent, and 160 ft. high, overhanging the sea, with a deep though dry chasm between it and the mainland, and it is approached by a steep winding path. In 1296, Wallace is said to have taken the rock and the kirk of Dunnottar from the English. During the Commonwealth, the Regalia of Scotland were hid in the castle from the republican army, and before the garrison surrendered to Cromwell's troops, 1651, the Regalia were removed and secreted in the church of Kinneff, by Mrs. Grainger, the minister's wife. In the times of James II. and Charles II., Dunnottar Castle was one of the state prisons, where the Covenanters were confined. It was dismantled after the rebellion of 1715, on the attainder of the last Earl Marischal.

DUNOIS, *dünwâ* JEAN (called the Bastard of Orleans), Count of Dunois and Longueville: brilliant French soldier, 1403-1468, Nov. 24; natural son of Louis Duke of Orleans, brother of Charles VI., and brought up in the house of that prince with his legitimate children. Dunois is said to have been intended for the priesthood, but this is doubted. His first important military achievement was the overthrow of the English at Montargis (1427). He next threw himself into Orleans with a small body of men, and bravely defended the place till the arrival of the famous Joan of Arc, whose religious enthusiasm combined with the valor of the Bastard raised the drooping spirits of the French, and the English were obliged to raise the siege. This was the turning-point in the fortunes of the French nation. In

DUNS SCOTUS.

1429, Dunois and the Maid of Orleans won the battle of Patay, after which he marched, with a small body of men, through the provinces then overrun by the English, and took the fortified towns. The capture and death of Joan of Arc arrested for a moment the progress of the French arms, but the heroism of Dunois was irresistible. He took Chartres, the key of Paris, forced Bedford to raise the siege of Lagny, chased the enemy from Paris, and within a very short period deprived them of all their French conquests except Normandy and Guienne. The next grand series of successes on the part of Dunois, was the expulsion of the English from Normandy. Town after town yielded—Rouen, Harfleur, Honfleur, Caen, Falaise, Cherbourg. This splendid campaign lasted only a year and six days. Not less triumphant was his career immediately after in Guienne; Montguyon, Blaye, Fronsac, Bordeaux, and lastly Bayonne, fell into his hands. The English, in fact, were swept out of the country, and the freedom of France from all foreign occupation permanently secured. Louis XI., on his accession to the throne, 1462, dispatched Dunois as gov. to Genoa, which had yielded itself to France, but soon, in a fit of jealousy and suspicion, deprived him of all his offices. Dunois now placed himself at the head of the alliance *Pour le Bien Public*, and by the treaty of Conflans, 1465, recovered all his confiscated estates. There is scarcely any other name more popular in France than that of Dunois; there is no hero so national; he labored 25 years for the deliverance of his country, and this *alone*—his sword was never unsheathed, except against the English. He never had a force under him which could enable him to win a victory that might balance Agincourt or Crécy, but the multitude and constancy of his petty successes served the cause of France more effectively than great and sanguinary contests would have done.

DUNOON, *dŭn-ôn′:* one of the most frequented sea-bathing places and summer residences in the w. of Scotland; in the s.e. of Argyllshire, on the w. side of the Firth of Clyde, nine m. w. of Greenock. A village stood here from a very early date, but a new well-built town, with fine villas around, has of late years sprung up. Dunoon Castle, of which only a small part remains, stood on a conical hill near the pier, and was once a royal palace and strong fortress. The Argyll family had a residence here, but the building became a ruin about 1700. Pop. 5,283.

DUNS, *dŭns*, or Dunse: burgh of barony in the Merse, in the middle of Berwickshire, Scotland, the largest town in the county; on an eminence on the Whitadder. To the n. of the town is Duns Law, 630 ft. high. The name Dunse was changed to Duns (the ancient form) 1882. Pop. (1901) 2,206.

DUNSINNANE, *dŭn-sĭn′ān:* one of the Sidlaw Hills, in the east of Perthshire, Scotland, 1,114 ft. high, 7 m. n.e. of Perth, and with a prospect toward Birnam Hill (q.v.). On

the top are the remains of the rampart and fosse of an ancient fortification, popularly called Macbeth's Castle.

DUNS SCOTUS, *dŭnz skō'tŭs:* one of the most famous scholastics of the 13th c. His history is partially obscure. England, Scotland, and Ireland all claim the honor of his birth-place, but without any support beyond inference from his name. As to the date of his birth, all that can be said is, that it was in the last half of the 13th c. Whatever was the history of his youth, he entered early the order of Franciscans, studied at Oxford, and soon became prof. of theology. His prelections were attended by crowds of auditors, the number of students at Oxford then exceeding 30,000. About 1304, he removed to Paris, then the chief seat of scholastic philosophy, where he taught theology with great applause. He was distinguished for the zeal and ability with which he defended the immaculate conception of the Virgin against Thomas Aquinas. He is said to have demolished 200 objections to the doctrine, and established it by a cloud of proofs. It continued long a point of dispute between the Scotists and Thomists; and it was only in 1854 that the dogma was by papal authority declared a necessary doctrine of the Rom. Cath. faith, which it is now heresy to deny. In 1308, Duns Scotus was called to Cologne to oppose the heresies of the Beguin brethren, and there he suddenly died, in the 34th or the 43d year of his life. Duns Scotus was mostly opposed to Thomas Aquinas, in theological opinions, and held very tenaciously the doctrine of the absolute freedom of the human will, from whose spontaneous exercise he derives all morality. He was a realist in philosophy, and his followers are on that ground opposed to the Occamists, who were nominalists: see NOMINALISM. He defended his opinions in the style of dialectic then in vogue, and with an acuteness that got him the name of Doctor Subtilis. When, however, at the revival of learning, the followers of Duns, or *Dunsmen*, saw that the hair-splitting style of reasoning was going out of fashion, they 'raged,' as old Tyndal says, 'in every pulpit' against the new classic studies, so that the name gradually came to signify not only one opposed to learning, but one slow at learning; hence our word *dunce*, a blockhead. It would be difficult to indicate the nature of his speculative opinions without entering into particulars, nor are his writings as yet sufficiently explored for the formation of a decided judgment. The most famous of his works, besides his commentaries on the Bible and on Aristotle, is his Commentary on the Sentences of Peter Lombard, called the *Opus Oxoniense*, of which the *Opus Parisiense* is an abridgment. The chief edition of his works is that of Luke Wadding (12 vols. Lyon 1639), but it is far from complete. The controversies long carried on between the Scotists and Thomists owed their bitterness not so much to zeal for science and religion, as to the jealousy between the Franciscans and Dominicans.

DUNSTABLE, *dŭn'sta-bl:* town in the south of Bedfordshire, England, at the e. base of the Chiltern chalk-hills or Dunstable Downs, 18 m. s.s.w. of Bedford. It consists chiefly of one main street crossed by another. The houses are mostly of brick, some of them very old. Dunstable is the chief seat of the British straw plait manufacture, which employs many women. Whiting also is made. In winter, many large larks are caught in the neighborhood, and sold chiefly in London as an article of luxury. Henry I. founded here a priory of Black Canons, of which the present parish church is a part. Dunstable was the scene of some of the earliest theatricals, 1110, the subject being the miracles of St. Catherine, by Abbot Geoffry of St. Albans. Pop. (1901) 5,157.

DUNSTAN, *dŭn'stan,* Saint: 925–988, May 19; b. at or near Glastonbury, in Somersetshire, England. He was of noble birth, and is said to have been remotely related to the royal family, and more nearly related to high dignitaries in the church. His early studies were superintended by Irish teachers; but besides his professional learning, Dunstan possessed a variety of accomplishments. He was an excellent composer in music; he played skilfully on various instruments; he was a painter, a worker in design, and a caligrapher; a jeweller, and a blacksmith. While quite a youth he was presented at the court of King Athelstan, who seems to have been delighted with his music; but the courtiers envying the favor of the sovereign, denounced him as a dealer in sorcery, and procured his expulsion from court. Dunstan now began to figure in a new character. Contiguous to the church of Glastonbury, he erected a cell, five ft. in length by two in breadth, the floor of which was sunk beneath the surface, while the roof, on the outside was only breast-high, so that he could stand upright in it, though unable to lie at full length. This was at once his bed-chamber, his oratory, and his workshop. It was here that (according to the monkish legends) he had his most celebrated contest with the devil. One evening, while the saint was employed at his forge, the devil thrust his head in at the window, and began to tempt him with some immoral propositions. Dunstan patiently endured the annoyance until his tongs were red in the fire, when, snatching them suddenly up, he seized the foul fiend by the nose, and held him till the whole neighborhood resounded with the clamor of his agony. Gradually, Dunstan acquired a great reputation for sanctity; and on the accession of Edmund to the throne 940, he was recalled to court; but in spite of the exploits and penances which had made his banishment illustrious, he was still opposed by the courtiers, who saw his ambition, and dreaded his talents. A second time Dunstan was dismissed, but the king made him Abbot of Glastonbury, and increased the privileges of that monastery. Edred, nicknamed *debilis pedibus* (weak in the feet), who succeeded Edmund 946, showed Dunstan great favor. The saint now began to distinguish himself as a statesman, and

the vigorous policy of Edred's reign is affirmed to have proceeded from the inspiration of Dunstan. If that was the case, then to Dunstan was owing the complete subjugation of the Northumbrian Danes. Edred was succeeded by Edwy 955, who detested Dunstan, and not without reason, for the saint, on the day of Edwy's coronation, had grossly insulted his wife and her mother. Besides, Edwy had long suspected Dunstan of peculation in his charge, and this outrage made his wrath overflow. Dunstan was deprived of his clerical office, his places at court were taken from him, his so-called reform—viz., of compelling the clergy to become celibates—was frustrated, the monks were driven out of their monasteries, their functions handed over to the secular clergy, and Dunstan himself was banished. He fled to Flanders, narrowly escaping having his eyes put out by the messengers whom the infuriated king had sent after him. After Dunstan's flight, a rising took place among the Northumbrian Danes, instigated by Odo, Abp. of Canterbury, himself a Dane, and a friend of the expatriated saint. Edgar, the brother of Edwy, was chosen king of the whole of the island n. of the Thames, and Dunstan returned in triumph from his brief exile. Meanwhile, Edwy's beautiful wife, Elgiva, had been seized and murdered, under circumstances of horrid cruelty, by the Mercians, who were armed in the cause of Dunstan and Odo, or, as others say, by the immediate retainers of these ecclesiastics themselves. Edwy himself died of a broken heart, or (according to an old MS. in the Cottonian Library) was assassinated 958, and was succeeded by his brother Edgar. The latter, as a boy of 15, could exercise little authority: he was long a passive instrument in the hands of Dunstan and his party, who used their power in establishing their cause over the whole island, in enforcing the celibacy of the clergy, and in driving out by main force from all abbeys, cathedrals, and churches, all such married clergymen as would not separate from their wives. At the same time, it cannot be denied that Dunstan and the monks ruled the kingdom with vigor and success, and consolidated the detached states into compacter union than had ever been known before. The Danish districts of Anglia and Northumbria were divided into earldoms or governments; the fleet of the king was increased to 360 sail, which acted as a most efficient coast guard, preventing the Norse rovers from making their usual destructive descents on the country. In 960, Dunstan was made abp. of Canterbury on the death of his friend Odo, when, according to custom, he went to Rome to receive the pall at the hands of the pope. He also induced Edgar to visit in person every part of his dominions annually, when courts of justice were held in the various districts, audiences and feasts given, and appeals heard. The many other beneficial measures of Edgar's reign, such as the reform of the coinage, and the endeavor to extirpate wild animals in the mountainous districts, are generally, and with good reason, attributed

to Dunstan. The king, who was zealous for the celibacy of the clergy, was himself one of the most viciously profligate of the Saxon kings; yet Dunstan could wink at his crimes, so long as he himself was allowed to carry out his 'religious' schemes. On the death of Edgar, a fierce struggle took place between the partisans of Edward the Martyr and his half-brother Ethelred. The cause of the former was espoused by Dunstan, who succeeded in placing his favorite on the throne; but the mother of Ethelred, named Elfrida, a beautiful but ferocious woman, caused Edward to be murdered 979, and Dunstan was compelled to place the crown on the head of Ethelred. The credit and influence of the great monk now declined; his threatenings of divine vengeance were treated with contempt; and soured and exasperated at the triumph of his enemies, he retired to his archiepiscopal city, where he died of grief and vexation. Dunstan was a man of extraordinary abilities. His vigor, his persistency of purpose, and his stern and unscrupulous disposition, would have elevated him to power in any age; but he possessed, in addition to these qualities, a deep knowledge of the weaknesses of human nature, and a clear and penetrating understanding, which enabled him to see what it was necessary and prudent for a ruler to do. Hence, though despotic to the last degree, he was not blindly so, like a commonplace despot. His ambition was ever under the control of his wisdom and his fixed ideas. Early in his career, he introduced a new order of monks into the land, the Benedictines, whose strict discipline had changed the character and condition of ecclesiastical affairs, and in spite of the confusion and even opposition thus caused, he persevered to the end. Monasteries continued to be founded or endowed in every part of the kingdom; and such were the multitudes who devoted themselves to the cloister, that the foreboding of the wise Bede was at length accomplished—above a third of the property of the land was in possession of the church, and exempted from taxes and military service. Dunstan's *Concord of Monastic Rules* will be found in Reyner's *Apostolatus Benedictinorum in Anglia*, fol., Duac. 1626, page 77 of the Appendix. Other writings have been attributed to him. See Wright, *Biog. Brit. Lit., Ang.-Sax. Period.* See also William of Malmesbury, Lingard's *History of England*, Kemble's *Saxons in England*, book II., and *Memorials of St. Dunstan*, edited by W. Stubbs, M.A. (1875), a collection of six biographies of the saint.

DUNSTER, *dŭn'stĕr*, HENRY: 1612–1659, Feb. 27; b. Lancashire, England. He was educated at Magdalen College, Cambridge; became a non-conformist, and emigrated to the United States to escape persecution 1640; was elected the first pres. of Harvard Univ. shortly after his arrival and installed into that office and the pastorate of the First Church (Congl.), Cambridge, 1640, Aug.; and occupied both offices till 1654, Oct., when he was compelled to resign for preaching against the validity of infant baptism. He was tried and placed under bonds for this offense, and

soon afterward was indicted by the grand jury for neglecting the baptism of one of his own children. He subsequently removed to Scituate, Mass., and preached there till his death. Pres. Dunster was a man of profound learning, an eminent oriental scholar, and an authority on the Hebrew language.

DUNWOODY, Henry Harrison Chase, American meteorologist: b. Highland co., Ohio, 1842, Oct. 23. He was graduated at the U. S. Military Academy in 1866 and from the Columbia Law School in 1876 and having been detailed in 1872 for duty on the Signal Corps, was appointed in 1891 to the Weather Bureau, then first constituted. His special work has been that of formulating official forecasts of the weather, and he originated the system of coldwave warnings; in this connection he recommended the organization of State weather services. He is the author of many papers on meteorological subjects published by the Signal Service. In 1904 he was appointed Brigadier General and retired.

DUNT: see Dunch.

DUODECIMAL, a. *dū′ŏ-dĕs′ĭ-măl* [L. *dŭŏdĕcĭm*, twelve — from *dŭŏ*, two; *dĕcĕm*, ten]: computing by twelves. Du′odec′imals, n. plu., a number system based on the scale of 12, as when the foot is divided into 12 inches. Formerly the arithmetics gave much attention to this system, carrying it parallel to the decimal method, and elaborating it in connection with square measure, etc. Counting by 12's has some advantages on account of the divisibility of 12 by so many numbers, viz., 2, 3, 4, and 6. But the system is practically obsolete and is no longer included in standard text-books. Engineers of ten divide the foot into tenths instead of inches. And the whole tending is toward a universal decimal system. Du′odec′imo, n. *-mō* [It. *duodecimo*, twelfth]: that form of volume whose leaf is equal to the twelfth part of a folio—the folio being the large sheet called the *broadside*, folded once. A book is said to be *quarto*, *octavo*, *duodecimo*, etc., because the sheet of which the page of the book are made up has been folded into four, eight, twelve, leaves, etc. Quarto, octavo, and duodecimo, are almost always written 4to, 8vo, and 12mo. See Paper. Du′odec′imally, ad.

DUODECIMFID, a. *dū-ō-dĕs′ĭm-fĭd* [L. *duodecim*, twelve; *findo*, I cut] divided into twelve parts.

DUODECIMOLE, n. *dū-ō-dĕsh-ĭm′o-lā* [It.]: in *mus.*, a group of twelve notes.

DUODENARY, a. *dū-o-dĕn′a-rĭ* [L. *duodecim*, twelve]: pertaining to the number twelve; proceeding by twelves; twelvefold. Duodenary arithmetic, n. in *math.*, a system of computation in which the local value of the digits increases twelvefold as they proceed from right to left, instead of tenfold, as in ordinary computation. Duodenary scale, n. the same as duodecimal scale.

DUODENUM, n. *dū′ŏ-dē′nŭm* [L. *dŭŏdēnī*, twelve each]: the first part of the small intestines immediately succeeding the stomach, which in man is about twelve inches in length.

Du'ode'nal, a. *-năl*, connected with, or relating to, the duodenum: see Digestion.

Duodenitis, *nī'tĭs*: inflammation of the duodenum. It frequently results from an acute gastric irritation and is, in a large number of cases, the affection which causes biliousness. The main symptoms are headache, languor, nausea, loss of appetite, constipation, coated tongue, foul breath, and, at times, a certain amount of jaundice. This latter is due to the fact that the inflammation in the duodenum causes a swelling of the mucous membrane of the common bile duct and leads to partial occlusion of its passage. The treatment is careful diet, hot water and hygienic living.

DUODRAMA, n. *dô-ō-drâm'a* [Italian]: dramatic piece for two performers only.

DUOLO, n. *dwō'lō* [It.] grief; in *mus.*, with grief, sadness, pathos.

DUP, v. *dŭp* [contraction of *do up*, as *doff* = do off, and *don* = do on: Swiss, *tuffen*, to open]: to do up; to fasten; in *OE.*, to open. Dup'ping, imp. Dupped, pp. *dŭpt.*

DUPANLOUP, *dü-pŏng-lô'*, Felix Antoine Philibert, Bishop of Orleans: 1802, Jan. 3—1878, Oct. 11; b. St.-Félix, Savoy. He was educated in Paris; ordained a Rom. Cath. priest 1825; appointed confessor to the Comte de Chambord 1827, catechist to the Orleans princes 1828, and almoner to Mme. la Dauphine 1830; was naturalized 1838; and after the Revolution was appointed superior of the diocesan seminary at Paris. In 1849 he was appointed bp. of Orleans, 1854 elected a member of the French Acad., and 1871 elected a member of the corps legislatif, and nominated abp. of Paris, but declined that office. He published a number of works including *Education*, 3 vols. (1855–57), *The Higher Intellectual Education* (1866), *Christian Marriage* (1868), *Elements of Sacred Rhetoric, Exposition of the Principal Truths of the Catholic Faith, Manual of the Catechism*, besides funeral orations and pastoral letters.

DUPE, n. *dūp* [F. *dupe*, one who lets himself be deceived —from *duppe*, the bird called the *hoopoe*]: one who is deceived; one easily led astray; a credulous person: V. to cheat; to trick; to deceive by imposing on one's credulity. Dupable, or Dupeable, a. that may or can be easily duped gulled, cheated or deceived. Dupeability, n. capability of being easily duped or gulled; easy credulity. Du'ping, imp. Duped, pp. *dūpt.* Du'per, n. one who. Du'pery, n. *-pėr-ĭ*, the act or practice of duping.

DUPIN, *dü-păng'*, Andre Marie Jean Jacques: French statesman and lawyer: 1783, Feb. 1—1865; b. Varzy, dept. of Nièvre. He studied in Paris. In 1815, he was elected a member of the chamber of representatives, when he opposed the motion for proclaiming Napoleon II. successor to the throne. During the same year, he published his treatise, *Sur la Libre Défense des Accusés*. The attention excited by this work procured him the honor of defending Marshal Ney, and afterward the English officers, Wilson, Bruce, and Hutchinson, accused of having favored Lavalette's escape.

He defended also the poet Béranger in 1821. From 1825–29, he was the advocate of the liberal party. In his pamphlet, *La Révolution de* 1830, he endeavored to prove the legal character of this revolution; and on the question being mooted whether the new king should assume the title of Philippe VII., Dupin declared 'that the Duke of Orleans was called to the throne not *because* he was a Bourbon, but *although* he was a Bourbon, and on the condition that he should not follow in the footsteps of his predecessors.' After having been appointed to various important offices by the new government, Dupin found it necessary to pass over to the opposition, and was eight times chosen pres. of the chamber of deputies. At the revolution of 1848, he urged (but unsuccessfully) the chamber to proclaim the Comte de Paris king of the French, with the Duchess of Orleans regent during his minority. In consequence of the confiscation of the Orleans estates, 1852, Dupin resigned his place, and retired for a time from public life; but in 1857 he consented to resume his previous office of *Procurer-Général* of the court of cassation. He was author of many important works, mostly on legal questions, among which were *Manuel du Droit Ecclésiastique Français*, which was censured by the congregation of the *Index* at Rome. In 1853 appeared his *Le Morvan: Topographie, Agriculture, Mœursèdes Habitants, État Ancien, Etat Actuel;* and in 1857, *Règles Générales de Droit et de Morale tirées de l'Ecriture Sainte.*

DUPIN, Francois Pierre Charles, Baron: French economist: 1784, Oct. 6—1873; b. Varzy, dept. of Nièvre; brother of André Marie Jean Jacques Dupin. He was educated at the Polytechnic School, Paris. During the Empire he was actively employed as engineer. Between 1816–19, he made several visits to England and Ireland, to study the great works of construction in those countries. The results of his investigations appeared in his *Voyages dans la Grande Bretagne* (6 vols. Paris 1820–24, with atlas) a comprehensive statement of the advantages and defects of British internal administration, exhibiting in a popular form a complete view of the roads, canals, aqueducts, bridges, ports, etc., of the country. Dupin was about this time appointed member of the Académie des Sciences, and in 1824 was raised to the rank of baron. In 1828, he was elected deputy for the dept. of Tarn, and he took part with the liberal opposition. After the February revolution of 1848, Dupin was member of the constituent assembly. After the *coup d'état*, he became a senator of the Empire. Dupin published many works on geometry. commerce, etc.

DUPLEIX, *dü-plā'*, Joseph Francois: celebrated governor of the French Indies: born about the close of the 17th c.; d. 1763. In 1720 he was appointed to a seat in the council at Pondicherry, and ten years later became superintendent at Chandernagore The remarkable success of his administration here led to his being appointed, in 1742, gov.-gen. of all the French Indies. His policy had already

begun to alarm the English Company, when war broke out in Europe between France and England (1744). La Bourdonnais, gov. of Mauritius, having sailed with a powerful squadron to the Coromandel coast, took Madras, but stipulated to surrender it on payment of a certain sum. This, however, Dupleix refused to accede to, and violent disputes followed between the two governors, the result of which was that La Bourdonnais was recalled. The ambitious mind of Dupleix now formed the project of founding a French empire in India on the ruins of the mogul monarchy, and with this purpose he meddled with all the intrigues of southern and central India, made himself master of the court of Hyderabad, and placed a creature of his own on the throne of the Carnatic, while he impressed the native imagination by adopting all the pomp and splendor of the Oriental. His military designs, however, were frustrated by the English, but the struggle continued until 1754, in which year Dupleix was recalled. The French Company had not seconded his ambitious schemes, and refused to reimburse him for the vast sums he had spent out of his private fortune in promoting the war. He died in poverty and neglect.

DUPLEX, a. *dū'plĕks* [L. *duplex*, twofold, double—from *dŭŏ*, two; *plĭcō*, I fold]: twofold; denoting a peculiar kind of watch in which the scape-wheel has two sets of teeth producing a double action; denoting the system of telegraphy which enables messages to be sent from both ends of the same wire at the same time; see under TELEGRAPH. DUPLEX-ESCAPEMENT, n. in *horology*, an escapement so called from the double character of its scape-wheel, which has spur and crown teeth. It was invented by Dr. Hooke about 1658, and improved by Dyrer and Bregnet. DUPLEX-LATHE, n. a lathe invented by Fairbairn for turning off, screwing and surfacing. DUPLEX-PUMPING ENGINE, n. an arrangement in which two steam-engines of equal dimensions are placed side by side, one operating the steam valves of the other. DUPLEX-PUNCH, n. a punch having a counter-die mounted on an opposite jaw, as the ticket-punch; a punch having a force derived from the rolling action of two levers on a common fulcrum, forming a toggle. DUPLEX-RATIO, n., in *math.*, the product of a ratio. DUPLEX-TYPE, n., in *photog.*, a name given to a mode of taking two photographs of the same person in different positions by two operations, so that he shall appear in two characters, for instance playing the piano and accompanying himself on the violin. It is done by two exposures, with some skilful mode of hiding the division line. Shive's duplicating reflector is constructed for this purpose.

DUPLICATE, a. *dū'plĭ-kāt* [L. *duplĭcātus*, doubled—from *dŭŏ*, two; *plĭcō*, I fold: It. and F. *duplicata*, a duplicate]: double; twofold: N. a second thing corresponding to the first; a copy; a pawnbroker's ticket; in *law*, a document corresponding exactly in all essential points with another, and differing from a copy only in having all the validity of the original, as the *duplicate* of a lease, etc.: V.

to double, to fold. DU'PLICATING, imp. DU'PLICATED, pp. DU'PLICA'TION, n. *-kā'shŭn* [F.—L.]: the act of doubling. DUPLICATION OF THE CUBE: see DOUBLING THE CUBE.—DU'PLICA'TURE, n. *-tūr* [F.—L.]: a doubling; a fold. DUPLICITY, n. *dū-plĭs'ĭ-tĭ* [F. *duplicité*—from L. *duplĭcĭtātem*]: doubleness of heart or speech; deceit; deception; in *law*, the pleading of two or more distinct matters or single pleas. DUPLICATE RATIO: see PROPORTION.—SYN. of 'duplicity': dissimulation; guile; double-dealing; doubleness.

DUPLO, ad. *dū'plō* [L. *duplus*, double, twofold]: in *chem.*, a prefix used to express twofold or twice as much; as, *duplo-carburet*, twofold carburet.

DUPONCEAU, *du-pŏn'sō*, F. *dü-pŏng-sō'*, PETER STEPHEN, LL.D.: 1760, June 3—1844, Apr. 1; b. in the island of Rhé, France: author. He came to the United States 1777, and served some time in the army as aide-de-camp to Baron Steuben; was naturalized 1781; studied law, and settled in Philadelphia to practice. He published a number of philological treatises, legal essays, and miscellaneous papers, and a *Dissertation on the Nature and Extent of the Jurisdiction of the Courts of the United States* (1824), and a *Memoir on the Indian Languages of North America* (1835), for which he received a prize from the French Institute. He was pres. of the American Philosophical Soc. many years.

DUPONT, *dü-pōng'*, JACQUES CHARLES, styled DE L'EURE: 1767, Feb. 27-1855; b. Neubourg, Normandy: leader of the French liberal party. During the revolution and the Empire, he filled several important offices. In 1813, he became a member of the legislative body, and acted as vice-pres. when this assembly was convoked by Louis XVIII. on the fall of Napoleon. During the Hundred Days he was elected to represent the dept. of Eure, and, after the battle of Waterloo, became vice-pres. of the chamber of representatives. After the revolution of 1830, he was appointed minister of justice, but at the end of six months sent in his resignation, and took his place in the ranks of the opposition. After the revolution of 1848, during the session of Feb. 24, Dupont took the presidents' chair, and so far silenced the tumult of the populace, as to render it possible to appoint a provisional government, of which he was proclaimed president. His political friends styled him the most virtuous among the virtuous, the Aristides of French liberalism. His disinterestedness was not denied even by his enemies; but he manifested fidelity to his convictions rather than energy of character.

DU PONT, *du-pŏnt'*, SAMUEL FRANCIS: rear admiral U. S.N.: 1803, Sept. 27—1865, June 23; b. Bergen Point, N. J.; grandson of PIERRE SAMUEL D. DE NEMOURS. He entered the navy as midshipman 1815, was commissioned lieut. 1826, and promoted commander 1842, capt. 1855, rear-admiral 1862. He was assigned to the command of the *Cyane* of the Pacific sqadron 1846, July 23, and with it captured San Diego and La Paz, cap. of Lower Cal.,

and cleared the Gulf of Cal. of Mexican ships; led the line of boats that entered the harbor of Mazattan prior to its capture 1847, Nov. 11. In 1859 he was appointed commandant of the navy yard at Philadelphia; 1860, Dec., took prompt measures to protect the landing of vols. at Annapolis; 1861, June, was made pres. of a board to prepare a plan for naval operations; Sep., was appointed flag officer; Oct., led the expedition that sailed from Norfolk; Nov. 7, captured the fortifications in Port Royal harbor; and subsequently occupied a long stretch of territory between Port Royal and St. Augustine, and established 14 blockading stations. For these services he received the thanks of congress and the newly-created rank of rear-admiral. He was relieved from active service 1863, July.

DU PONT DE NEMOURS, *dü-pōng' dĕh nĕh-môr'*, Pierre Samuel: 1739, Dec. 14—1817, Aug. 6; b. Paris: political economist. At an early age, he became a believer in and an earnest advocate of Quesnay's principles of political economy, published several financial treatises 1762 and his first important book, *The Exportation and Importation of Grain*, 1764. This was followed by *The Origin and Progress of the New Science* and *Physiocratie* (1768), *Du Commerce de la Compagnie des Indes* (1769), *Histoire abrégée des Finances de l'Angleterre* (1769), and *Observations sur les Effets de la Liberté du Commerce des Grains et sur aux des Prohibitions* (1770). He was editor of the *Journal of Agriculture, Commerce*, and *Finance*, 1765-6, and subsequently of the economist organ *Ephémérides du Citoyen;* became a councillor of state under Calonne; sec. of the assembly of notables 1787; member of the national assembly 1790 and twice its pres.; was among the personal defenders of the king at the Tuileries 1792; was condemned to death but escaped through the death of Robespierre 1794; and was elected a member of the council of elders 1795, and its pres. 1797. In 1798 he came to the United States to escape persecution, prepared a scheme for a system of national education, and returned to France 1802. Napoleon tendered him various public offices, but he would accept none; he, however, became pres. of the chamber of commerce of Paris and of a number of benevolent institutions. He was sec. of the provisional govt. that sought the return of Louis XVIII., 1814, but on the reappearance of Napoleon, 1815, he again came to the United States where he died.

DÜPPEL, or Dybböl: village in the Prussian province of Schleswig-Holstein, 15 m. n.e. of Flensburg. During the war between Germany and Denmark it was bombarded for more than a month by the Prussians, and finally taken 1864 April. It and Sonderburg, on the island of Alsen, now constitute a strong fortress.

DUPPER, n. *dŭp'pĕr*, or Dubber, n. *dŭb'bĕr* [Hind. *dabba*]: a short-necked globular bottle made of buffalo-hide, for containing oils, etc., when sent from India.

DUPRÉ, *dü-prā'*, Giovanni: 1817, Mar. 1—1882, Jan. 8 b. Siena, Italy: sculptor. His father was an engraver on wood in humble circumstances, and apprenticed him to a carpenter when a mere boy. His natural artistic abilities were developed under adverse conditions, and when he had attained proficiency with the chisel, he was led by devotion to the Rom. Cath. Church to make a specialty of religious subjects. He received a first class medal at the French Universal Exposition 1855, and a second at that of 1867, received the cross of the French legion of honor 1867, and the Italian order of the crown 1868, and was elected an associate member of the French Acad. of Fine Arts 1869.

DUPRÉ, Jules: 1811, Apr. 5—1889, Oct. 6; b. Nantes; painter. He was the son of a porcelain manufacturer,and while following that industry took lessons in drawing, designing, and painting. He began exhibiting 1831, took a second class medal 1833, another at the Universal Exposition 1867, received the decoration of the legion of honor 1849, and became a grand officer 1870, and was a member of the committee on the Salon exhibition 1881.

DUPUIS, *dü-pwē'*, Charles Francois: French *savant:* 1742, Oct. 16—1809, Sep. 29; b. Trie-Chateau, near Chaumont; son of a poor schoolmaster. At the college of Harcourt he so soon acquired extensive knowledge that at the age of 24 he was made prof. of rhetoric in the college of Lisieux. At the same time he studied law, and was admitted an advocate. He was led to the thought of explaining mythology by means of astronomy. After several communications in the *Journal des Savants*, appeared his *Mémoire sur l'Origine des Constellations et sur l'Explication de la Fable par l'Astronomie* (Par. 1781). He was now appointed prof. of eloquence in the Collège de France, member of the Académie des Inscriptions, and shortly afterward a member of the commission of public instruction. Although he rather shunned the storms of the Revolution, his reputation necessitated his becoming a member of the convention, next of the Council of 500, and after the 18th Brumaire, of the legislative body. He was also one of the 48 individuals who formed the nucleus of the Institut National. His great work, *Origine de tous les Cultes, ou Religion Universelle* (12 vols.), which he had long withheld from fear of offending the religious world, was published at Paris, 1794. In his last work, *Mémoire Explicatif du Zodiac Chronologique et Mythologique* (Par. 1806), he attempts to prove the unity of the astronomical and religious myths of all nations.

DUPUIS, Nathan Fellowes, Canadian scientist: b. Portland, Ontario, 1836, April 13. He was graduated at Queen's University, Kingston, in 1866, and has been a professor there for 28 years, occupying the chair first of chemistry and natural science, then of mathematics, which he still fills. He is a fellow of the Royal Society of Canada, and editor of the *Canadian Educational Monthly*. His published works include *Elements of Geometrical Optics* (1868);

Geometry of the Point, Line and Circle in the Plane (1889); *Elements of Synthetic Solid Geometry* (1893).

DUPUY, *dü-pwē'*, CHARLES: French statesman: b. Le Puy, France, 1851, Nov. 15. He was graduated at the École Normale des Hautes Études; spent several years teaching in provincial lyceums and colleges; became a school inspector 1880; and was appointed head-master of Corsica college and elected to the chamber of deputies as an advanced republican 1885. In 1892, Dec.—1893, Mar., he was minister of public instruction in the cabinet of M. Ribot; in 1893, Apr., became premier, also taking the portfolio of the interior; in Nov. following resigned with his entire cabinet and was succeeded by M. Casimir-Perier; 1894, Jan. 11, was a second time elected president of the chamber of deputies; in May succeeded M. Casimir-Perier as premier, on the election of the latter as president of the republic; and 1895, Jan., was succeeded by M. Ribot. He has published several works of a philosophical character and his educational reports have commanded much attention.

DUPUYTREN, *dü-pwē-trŏng'*, GUILLAUME, Baron: 1777, Oct. 6—1835, Feb. 8; b. Pierre-Buffière, in Limousin, France: surgeon. He was educated at the Collège de la Marche in Paris; and on the formation of a new school of medicine there, 1794, was appointed *prosecteur*. In 1801 he was appointed *chef des travaux anatomiques*, and applied himself to pathological anatomy. In 1803 he was appointed asst. surgeon, and 1815 first surgeon at the Hôtel Dieu. In 1813 he became prof. of surgery to the medical faculty; in 1820, Louis XVIII. conferred on him the title of baron, and in 1823 appointed him royal surgeon. He was the inventor of many ingenious modes of surgical operation and of various surgical instruments. He likewise made several important discoveries in pathological anatomy; and though he wrote very little, he formed a large school of enlightened surgeons in his native country. Among his works are *Leçons Orales de Clinique Chirurgicale Faites à l'Hôtel-Dieu* (4 vols. Par. 1830–34), and *Traité Théorique et Pratique des Blessures par Armés de Guerre*, edited by Paillard and Marx(Par. 1834).

DUQUESNE, *dü-kān'*, ABRAHAM, Marquis: 1610–1688, Feb. 2; b. Dieppe: French naval officer. He was trained under his father, the captain of a ship, for the naval service. In the war between France and Spain, he distinguished himself at Corunna, Tarragona, Barcelona, and other places. During the minority of Louis XIV., when the navy of France was inactive, he entered the service of Sweden, then at war with Denmark. Duquesne defeated the Danish fleet near Gothenburg, 1643, was elevated to the rank of vice-admiral, and by a succession of victories over the united fleets of Denmark and Holland, forced Denmark to conclude peace. He then returned to France, where he found the Spaniards prepared to support Bordeaux, which had declared itself for the party of the *Fronde* in 1650. Duquesne immediately collected a squadron at his own ex-

pense, and compelled Bordeaux to submit. He was employed next in punishing the pirates of Algiers and Morocco who infested the Mediterranean. On the revolt of Messina against the Spanish government, France sent him to support the insurgents in the Mediterranean. With a small force, Duquesne gallantly opposed the united fleets of Spain and Holland, commanded by De Ruyter, and 1676, Apr., completely defeated his enemies off the coast of Sicily, in the vicinity of Mount Etna. De Ruyter died a few days after. France thus obtained possession of the island of Sicily Louis XIV. rewarded Duquesne with the title of Marquis and a considerable estate. On the revocation of the Edict of Nantes, Duquesne was made the only exception to the general decree of banishment issued against all Protestants. His last achievement was the humiliation of Genoa. He died at Paris. See *Duquesne et la Marine de son Temps* (Par. 1872).

DUQUESNE, Fort: see Braddock, Edward: French War.

DURABLE, a. *dū′ră-bl* [F. *durable*—from L. *durab′ĭlĭs*, lasting, durable—from *dūrŭs*, hard: It. *durabile*]: having the quality of lasting long; not wearing out or decaying soon; permanent. Du′rably, ad. *-blĭ*. Du′rableness, n. *-bl-nĕs*, the state of being durable; power of lasting. Du′rabil′ity, n. *-bĭl′ĭ-tĭ*, the power of lasting long without perishing.—Syn. of 'durable': lasting, enduring; persistent; firm; stable; constant; continuing.

DU′RA DEN: between Cupar and St. Andrews, in Fifeshire, Scotland, a small glen through which runs a tributary of the Eden; famous for the numerous and beautifully preserved fossil fish entombed in its yellow sandstone, one of the upper beds of the Old Red, 300–400 ft. thick

DURA-MATER, n. *dū′ră-māt′ėr* [L. *dūrus*, hard; *māter*, a mother—in mid. L. matter, substance]: the tough fibrous outer membrane of the three membranes which invest the brain; the innermost membrane is called the *pia mater*, and the middle the *arachnoid membrane*. See Nervous System.

DURAMEN, n. *dū-rā′mĕn* [L. *durāmen*, hardness—from *dūrus*, hard]: the inner or *heart wood*, being the fully ripened wood of exogenous trees. The name is applied also to the harder and more highly colored portion of trees and branches. The division is often very marked between the *Duramen* and the *Alburnum* (q.v.) or sap-wood, the duramen being more dense and compact, and its tubes thickened and filled with the peculiar secretions of the plant, so that juices no longer freely flow through them. It is also very frequently of a darker color than the alburnum; in ebony, it is black; and some other trees are remarkable for the peculiar color of their wood, which appears, however, only in the duramen and not in the alburnum. As timber it is much more valuable and durable than the alburnum; and the distinction is as well known to the carpenter or cabinet maker as to the botanist.

DURAN, *dü-rŏng′*, Émile Auguste Carolus: French painter; b. Lille, France, 1837, July 4. After studying in the Municipal School at Lille, he went to Paris 1853, and was a student at the Louvre, won a travelling scholarship and went to Rome for study 1861; afterward studied in Spain and secured his first medal 1866, for *L'Assassiné*, a picture which the govt. purchased and placed in the museum at Lille. His reputation was greatly enhanced by a design for a ceiling in the Luxembourg 1878; but his fame rests largely on his skill as a portrait painter. Among his noted works are the portraits of Émile de Girardin and of his daughters, an equestrian portrait of Mdlle. Croizette, and a portrait of Pasteur, exhibited at the Royal Acad. 1888, which was greatly admired. He has received the decoration of the Legion of Honor and of the order of Leopold.

DURANCE, n. *dū′răns* [L. *durans*, enduring, lasting; It. *duranza*, duration]: imprisonment; custody; restraint of the person; a term applied to the leathern dresses worn by the lower orders; a stout woolen stuff formerly made in imitation of buff leather, and used for garments; also called Durant and Tammy. Durant, a. *dūr′ant*, lasting; continuing. Dura′tion, n. *-rā′shŭn*, continuance; length in time; power of continuance; permanency. Durance vile, confinement in prison.

DURANCE, *dü-rŏngs′*: river in the s.e. of France, rises in the dept. of the Hautes-Alpes, near the base of Mont Genèvre, one of the peaks of the Cottian Alps. It flows through the dept. of the Basses-Alpes in a southerly direction; then curving w. it proceeds toward the Rhone, forming the boundary between the depts. of Vaucluse and Bouches-du-Rhone, and joins that river about three m. below Avignon. Its principal affluents are the Buech and the Calavon from the right; and the Ubaye, the Bleone, the Asse, and the Verdon from the left. Its total length is about 180 m.—no part navigable. Its current is swift and impetuous, and carries down great quantities of sand and pebbles. Large quantities of timber are floated down from the forest districts upon its banks to Arles, and thence to the Mediterranean. An aqueduct 51 m. long has been recently constructed from the Durance to Marseille. This great work not only supplies Marseille with water, but affords water-power for driving machinery, and irrigates an otherwise parched area of 25,000 acres.

DURAND, *du-rănd′*, Asher Brown; 1796, Aug. 21—1886, Sep. 17: b. Jefferson, N. J.: engraver and painter. He served an apprenticeship at engraving with Peter Maverick, in New York, 1812–17, became his partner, and established a high reputation as an engraver by cutting the steel plate of John Trumbull's painting, *The Declaration of Independence*, on which he was engaged three years. He made a specialty of portraits and, besides his own work for the publications of the day, engraved many of the heads in *The National Portrait Gallery*. In 1835, he abandoned engraving, applied himself to painting and became eminent in landscape work. He was the founder of the National

Acad. of Design, 1826, and its pres. 1845–61. His principal landscapes are: *The Catskills from Hillsdale, The Franconia Mountains, Franconia Notch, Sunday Morning, The Rainbow, Primeval Forest, A Mountain Forest, Studies from Nature,* and *Kauterskill Clove.*

DURANGO, *dô-râng'gō:* state in Mexico; between lat. 23° 37′ and 27° 45′ n., long. 102° 30′ and 107° 17′ w.; bounded on the n. by Chihuahua, e. by Cohahuila, s. by Jalisco, w. by Cinaloa; 42,645 sq. m.. It is traversed by the Sierra Madre Mountains; has fine meadows and grazing lands, rich and fertile soil along its few streams; yields large crops of corn, maize, rice and other cereals; has large stock-raising interests. Its mountains abound in gold, silver and iron. Pop. 371,274.

DURANGO city, cap. of La Plata co., Col., on Denver and Rio Grande rr., 451 m. s.w. of Denver. Centre of an agricultural, stock-raising and mineral region; 3 banks, 2 daily, 2 weekly newspapers. Pop. 3,317.

DURANGO, *dö-rang'gō,* or GUADIANA, *gwâ-dē-â'nâ;* sometimes called also CIUDAD DE VICTORIA, *thē-ô-thâth' dā vĭk-tō'rē-â,* in honor of the first pres. of the Mexican Confederation: city in Mexico, on the s. slope of the Sierra Madre, at the elevation of 6,848 ft.—almost a mile and a quarter—above the sea; lat. 24° 2′ n., long. 104° 3′ w. It is near the Culiacan (q.v.), being 150 m. to the n.w. of Zacatecas. It is the cap. of the state of Durango, and is regularly built, with a cathedral and other churches, and with convents, a theatre, and a mint; and the inhabitants carry on manufactures in iron, wood, wool, and leather. It was founded 1559 by Alonzo Pacheco, as a military post. It is the seat of a Rom. Cath. bishopric. Pop. 31,092.

DURANT, *du-rant,* HENRY TOWLE: 1822, Feb. 20—1881, Oct. 3; b. Hanover, N. H.: lawyer and philanthropist. He graduated at Harvard Univ. 1841, and was admitted to the bar 1846, changed his original name of Henry Welles Smith, began practicing in Boston, and became professionally associated with several of the most eminent lawyers of his day. He engaged in several business enterprises which yielded great wealth, and, in the midst of a lucrative practice, suddenly disposed of his legal interests and became a lay evangelist (Congl.) 1863. Soon afterward his attention was directed to the subject of higher education of women, and he determined to provide an institution that should afford them superior advantages. His plans resulted in the erection, equipment, and endowment of Wellesley College, about 15 m. w. of Boston, which was opened 1875, Sep. The grounds, buildings, and equipment cost $1,000,000, and he gave a further sum which produces $50,000 annually for its support. He was a Christian worker of broad and unsectarian spirit, which is manifested in the rules of his college.

DURANTE, *dô-rân'tā,* FRANCESCO: 1684, Mar. 15—1755, Aug. 13; b. Naples: musical composer. He received a charity-school education, studied music with Gaetano

Greco and Scarlatti, applied himself to teaching and composition, and became director of the conservatory of Loreto 1742. His compositions, almost wholly for ecclesiastical use, number 62, and are distinguished by severity of style and purity of harmony. Many of his works have been presented in Europe and the United States with full orchestral accompaniment.

DURAZNO, *doo-räs′nō*, Uruguay, a department bounded on the n. by Tacuarembo, s.e. by Cerro Largo and Treinta y Tres, on the s. by Florida and Flores, and on the w. by Flores and Rio Negro. It is the most central of the departments, and in size the third. Area, 5,527 sq. m. A range of hills divide it into two sections or basins, of which one extends northward to the Rio Negro, and the other southward to the Yi River, the department lying between these two rivers. Numerous streams, rising in the central chain of hills, flow toward the south or north; the entire surface is, therefore, well watered, and furnishes grazing for a large number of cattle, sheep, horses, and mules. Pop. about 25,000.

DURAZNO, Uruguay, capital of the department of Durazno. It is situated near the Yi River, and is one of the principal stations on the Central Uruguay Railroad. As an active centre of the trading of the neighborhood, it has substantial buildings, a church, hotels, and shops. Pop. 2,000.

DURAZZO, *dô-rât′sō* (called by the Serbs *Dratsch*, and by the Slaves *Durtz*): maritime town of Albania, European Turkey, on the rocky peninsula of Peli, in the Adriatic; lat. 41° 19′ n., long. 19° 27′ e. It is fortified, and is a place of considerable antiquity. Its situation in a fertile district gives it an export trade in grain, oil, etc.; but in recent years, owing to partial failures in crops, and disease in olives, the exports have been small. Durazzo has large imports of British manufactured goods; also of sugar, coffee, rice, soap, and iron. Pop. (1891) 1,200. Durazzo is the ancient *Epidamnus*, founded abt. B.C. 627 by a conjoined band of Corcyræans and Corinthians under one Phaleus, a Heracleidan. It became a great and populous city, but was much harassed by the internal strifes ofparty, which ultimately led to the Peloponnesian war (q.v.). Under the Romans it was called Dyrrachium (whence its modern name), and became the seat of a Roman colony, and an important landing-place for those sailing from Brundusium in Italy to Greece. Here Pompey was for some time beleagured by Cæsar. Dyrrachium attained its highest consequence about the end of the fourth c., when it became the cap. of the Byzantine eparchy of New Epirus. After being possessed successively by the Ostro-Goths, the Bulgarians, the Normans, and the Venetians, and having been destroyed by an earthquake, it was finally conquered by the Turks 1502, in whose possession it remains.

DURBAN, or D'URBAN, *dėr-băn′*: chief port of the colony of Natal; lat. 29° 50′ s., long. 31° 10′e. Durban was

founded 1842, was named after Sir Benjamin Durban. gov. of the cape. It has railway communication with Pietermaritzburg, and with the coast. An observatory has been erected here. Pop. of bor. 48,410.

DURBAR, n. *dŭr'bâr* [Hind. *darbâr*, an assembly]: an audience-hall in India; the court of a native prince; the formal reception of native princes, as at the court of a sovereign by the governor-general of India for political purposes. On 1903, Jan, 1, a Coronation Durbar was held in Delhi to recognize King Edward as emperor of India. Its estimated cost was £1,750,000.

DURBHANGAH, *dër-bŭn'ga:* capital of a dist. of the same name in Bengal, India, province of Behar, Patna division. Pop. 73,320.

DURBIN, *dër'bĭn*, John Price, d.d.: 1800–1876, Oct. 17; b. Bourbon co., Ky.: Meth. Episc. clergyman. He was apprenticed to a cabinet maker when 14 years old, entered the itinerant ministry of the Meth. Episc. Church when 19, studied at Miami Univ. and graduated at Cincinnati College 1825, and soon afterward became prof. of languages in Augusta College, Ky. In 1831, he was chosen chaplain of the U. S. senate, 1832 was appointed editor of the *Christian Advocate and Journal*, 1834 elected pres. of Dickinson College, Penn., and held the office till 1845, and 1850–72 was sec. of the missionary society of the Meth. Episc. Church. He took an active part in the great slavery discussion in the gen. conference 1844, made two prolonged journeys to Europe in the interests of church missions, and besides contributions to religious and general periodicals, published *Observations in Europe, Principally in France and Great Britain* (2 vols. 1844), and *Observations in Egypt, Palestine, Syria, and Asia Minor* (2 vols. 1845).

DURDUM, DIRDAM, or Dirdum, n. *dër'dŭm* [W. *dowrd*, noise]: in *Scot.* and *prov. Eng.*, a familiar name for a great noise or uproar.

DUREN, *dü'rĕn* (the Roman Marcodorum, whence its former name, Mark-Duren): ancient town of Rhenish Prussia on the Roer, 18 m. e. of Aix-la-Chapelle. It is surrounded with walls, and has several churches remarkable for fine architecture. Duren has important manufactures of woolen cloths, iron and steel ware, paper, soap, leather, oil, etc. In the vicinity are iron foundries and other factories worked by water-power, obtained from the Roer. Here Charlemagne, on his way to attack the Saxons, held diets in 775 and 779. After an obstinate resistance, Duren was taken and burned by Charles V., 1543. In 1794, the French made it the cap. of the dept. of Roer; but in 1814 it was transferred to Prussia. Pop. 20,702.

DURENE, n. *dū'rēn* [L. *dūrus*, hard]: an aromatic body obtainable from coal-tar, the only known hydrocarbon of the benzene series, solid at ordinary temperatures.

DÜRER, *du'rĕr*, Albert: father of the German school of painting, 'the prince of artists,' as his countrymen loved

to call him; 1471–1528, Apr. 6; b. Nürnberg—born, according to an entry in his father's day-book, 'on the day of St. Prudentius, on a Friday of the holy week.' His father was a humble, pious goldsmith, of whom the great painter said: 'His daily speech to us was, that we should abound in love to God, and act faithfully toward our neighbor'. Dürer was carefully educated and instructed by his father in the goldsmith trade, and at 15 years of age executed a piece of work in chased silver representing the seven 'falls of Christ'—in reference to the tradition that Christ fell seven times while bearing His cross to Mount Calvary. Even as a child, drawing was his delight, and he was wont to astonish by the exactness with which he drew parts of the human body, and even whole figures, also lines and circles at the first strokes, without ruler or or compass. His father therefore bound him apprentice 1486 to Michael Wohlgemuth, the chief Nürnberg artist, with whom he served three years. From 1490 to '94 he travelled in Germany and the Venetian states; and on his return, his father 'bargained' with Hans Frei, a skilful mechanic at Nürnberg, to give Albert to wife his daughter Agnes, who turned out a perfect Xantippe, with nothing to recommend her but beauty and 200 florins. She embittered the whole course of his life, and, as his life-long friend Pirkheimer asserts, hastened his death. After receiving his diploma with all the honors and rights of a master, obtained for his famous drawing of Orpheus, he went to Venice 1505, where he painted a picture of the martyrdom of St. Bartholomew, and one of Adam and Eve, afterward bought for the gallery at Prague. He also visited Bologna, where it is said that he met Raphael, who esteemed him highly, and that each painted for the other his portrait. After this journey, his fame spread widely; and the Emperor Maximilian appointed him court painter with an annuity of 100 florins; and Charles V. confirmed the same in a document still in the Nürnberg archives. In 1520, he visited the Netherlands with his wife and their maid servant; and they were splendidly entertained at Antwerp and Bruges by the painters, a costly dinner being served on vessels of silver, the whole party conducting them home late in the night by the light of many torches. His expenses were often defrayed at the inns, and he was escorted free from city to city. He says in his journal: 'The people did obeisance unto me as if they were leading some great lord.' Dürer warmly embraced the doctrines of the Reformation; and his journal contains a long lamentation and prayer on hearing that Luther had been carried off to the castle of Wartburg. At Antwerp he records: 'I was now overcome by a strange sickness, of which I never yet heard from any man.' This was in 1521, and the 'strange sickness'—no other than consumption—took yet seven years to consume his strong frame; he died in his native city, in his 57th year.

Dürer's facility was almost incredible. He *thought out* his works, and then executed them without sketch, and

never altered a line. Of his coloring Fuseli says: 'Dürer excelled Raphael in juice and breadth of coloring as much as Raphael excelled him in every other quality.' His drawing was perfect. So quaint were the presentments of his genius, he may be called the Chaucer of painting. In his portraits, he not only caught the expression, but delineated character and passion. Dürer was the inventor of the art of etching. He found wood-engraving in its infancy and raised it to be a pattern for all times; he also discovered the method of bringing out wood cuts in two colors, Historical and other paintings by Dürer are at Vienna, Munich, Prague, Dresden, and Nürenberg. The oldest of his pictures extant is the portrait of himself of the year 1498, in the Florentine gallery. His engravings and wood-cuts are so numerous that with all his surpassing diligence it is known that for many of them he gave only the designs: 262 wood-cuts are known marked with his name, the most famous of which are the *Great Passion*, the *Little Passion*, his favorite work the *Revelation of St. John*, and the series called the *Triumph of Maximilian*, a copy of which is in the Advocates' Library in Edinburgh. In the British Museum, there is a volume with more than 200 original drawings by Dürer, formerly in the collection of Sir Hans Sloane, also an exquisite carving in hone-stone, of the Birth of St. John, and a number of engravings, bequeathed by Mr. Nollekens. His own list of his works enumerates 1,254 pieces.

In the last three years of his life he published works on perspective and measurement, on fortification, and on human proportion, of which last he lived long enough to correct only the first volume. See the lives by Heller, Roth, Campe, Thausing (transl. by Eaton 1882); in English, by W. B. Scott, Mrs. Heaton, and Heath. Deeply religious and reverent, he was also of a cheerful temperament, and was long chief magistrate of his native town, where there is a brass statue of him, designed by the famous sculptor Rauch, and his house is still seen at the corner of a street called by his name.

DURESS, n. *dū-rĕs'* or *dū'rĕs* [OF. *duresse*—from L. *duritĭă*, hardness—from *dūrus*, hard]: constraint, actual or threatened; imprisonment; restraint of liberty; in *law*, the plea of one who has obliged himself to pay or to perform—or of one who has committed a misdemeanor—that he was compelled to do so and should therefore be free from legal responsibility. Duress may be by imprisonment, or by threat. A bond signed under duress may be voided at law. Duress applies also when the force or threat is exercised on any near of kin to a person to compel his action. The violence in duress must have been such as to cause fear in one of ordinary firmness.

D'URFEY, *dĕr'fe*, Thomas: writer of plays and poems in the reign of Charles II., with whom he was a favorite for his wit, liveliness, and songs: d. at advanced age, 1723. In literature, he is remembered best for his collection of songs,

entitled *Pills to Purge Melancholy*, of which a fac-simile reprint was issued 1872. Addison was his friend.

DURGA: see DOORGA.

DUR'GA PU'JA: see UMA.

DURHAM, *dŭr'ăm:* city, cap. of Durham co., N. C.; on the Southern and Seaboard Air Line and the Norfolk and Western railroads. It has extensive tobacco manufactories, including chewing and smoking tobacco, snuff, cigars, and cigarettes; many churches, a seminary for young ladies, daily and weekly newspapers, and waterworks. Near Durham the surrender of Gen. Joseph E. Johnston, of the confederate army, occurred, 1865. Among the industries is the manufacture of a fertilizer consisting largely of tobacco. Pop. (1910) 18,241.

DUR'HAM: maritime county in the n.e. of England, between Tyne and Tees. It has 32 m. of coast, generally low, but with some cliffs; area 1,012 sq. m. five-sevenths arable. The surface is hilly, and slopes to the east. In the west, which is waste but rich in minerals, are branches of the Pennine chain, rising in Kilhope Law, 2,196 ft. Colber Law, 1,678; and Pontop Pike, 1,018. The two chief branches enclose the valley of the Wear, and send forth several parallel ranges, declining toward the coast, and inclosing many fertile tracts and sheltered valleys. The chief rivers are the Wear, Tyne, and Tees, navigable respectively for 12, 15, and 10 m. The rocks are new red sandstone, magnesian limestone, millstone grit, carboniferous limestone, rich in lead; and coal-measures, forming the valuable Durham coal-field, 25 by 10 m., with many faults, and with about 40 beds of coal, three to ten ft. thick. Basalt and greenstone trap dikes intersect the w. part of Durham. The mineral products are coal, limestone, black marble, freestone, ironstone, firestone, slate, millstone, grindstone, and lead. Large furnaces for the production of iron are in operation in various parts of the county. Durham is one of the chief counties in England for the production and export of coal; 500 ships, besides a fleet of steamers, are employed at Sunderland for this export alone. There are 240 collieries. Five of the coal-seams, at the depth of 20 to 100 fathoms, are worked horizontally for many miles: 212 m. of railway connect the mines and ports. The soil is a clayey or dry loam. The chief crops are oats, barley, wheat, turnips, beans and pease. The Teeswater or Holderness breed of cattle is famed for fattening, quantity of milk, and early maturity: see Ox. The Durham horses are famed for draught and the saddle. Many sheep are pastured on the hills. There are manufactures of iron, pottery, glass, alkalies, and chemicals, and salt, and much shipbuilding at Sunderland, South Shields, Jarrow, Hartlepool, and Stockton. Coal is the chief export. Durham is divided into 4 wards, 15 poor-law unions, and 60 parishes, many of which have been subdivided, owing to the increase of population. The chief towns are Durham, the county town, Sunder-

land, Darlington, Gateshead, South Shields, Stockton, and Hartlepool. The county sends eight members to parliament. Durham has some ancient barrows, and has afforded many Roman antiquities, as altars, urns, and coins. There are remains of a fine Roman station at Lanchester. Durham formed part of the Saxon kingdom of Northumbria (547-827). Subsequently, it suffered severely from the incursions of the Scots.—Pop. (1901) 1,194,590.

DURHAM COUNTY PALATINE, one of the three counties palatine of England, the other two being Lancaster and Chester. For the privileges of a county palatine, see PALATINE. The county palatine of Durham existed by prescription. It was the only county palatine in the hands of a subject, and belonged to the p. of Durham. By 6 and 7 Will. IV. c. 19, the county palatine of Durham is separated from the bishopric, and vested in the crown.

DU'RHAM, *dĕr'am:* parliamentary and municipal borough, and ancient episcopal city of England, near the middle of Durham co., built around a steep rocky hill 86 ft. high, nearly encircled by the Wear. On the top of the hill are the cathedral and castle. Ancient walls partly inclose the hill, from which are fine views of the fertile wooded country around, and of the suburbs across the river. The chief manufactures are mustard, carpets, paper, and iron. In the vicinity are coal-mines, and saline, chalybeate, and sulphurous springs. It sends one member to parliament. Durham arose about 995, when Bishop Aldune brought here St. Cuthbert's bones from Ripon, and built a church to enshrine them. On the site of this church, Bishop William de Carilepho, about 1093, began the present magnificent cathedral, a Romanesque structure in the form of a latin cross, to which additions continued to be made till about 1500. It thus exhibits the gradual changes of style between these periods. It was restored during last c. and has lately undergone extensive renovation. It is 507 by 200 ft., with a central tower 214 ft. high, and two w. towers 138 ft. high. The cathedral contains many old monuments. Here lies St. Cuthbert's (q.v.) remains. Here also are Bede's tomb and some manuscripts said to be in his hand-writing. Cardinal Wolsey was a prelate here. The bishop's income is now £8,000. The castle, formerly the residence of the bishops of Durham, now the seat of the University of Durham, was founded about 1072, by William the Conqueror, in the Romanesque style, but it has since been much altered. The dormitory, now the new library of the cathedral, which belonged to the monastery of Durham, is one of the finest in England. Two of the bridges over the Wear were erected in the 12th c. Durham was often attacked by the Scots.

A college was founded here 1290 by the prior and convent of Durham. It was abolished, however, at the dissolution of monastic houses in the reign of Henry VIII., and its endowments given to the dean and chapter of Durham. Under the Commonwealth, Cromwell instituted

a college here, and endowed it with the sequestrated revenues of the dean and chapter, to whom, however, these revenues reverted at the Restoration, when the college was suppressed. The present Univ. of Durham was opened for students 1833, under the provisions of an act of parliament, obtained by the dean and chapter during the previous year. A royal charter, 1837, empowered the univ. to bestow degrees. The Durham Univ. comprises professorships in divinity and ecclesiastical history, classical literature, mathematics and astronomy, and medicine, with lectureships in Hebrew, classical literature, and mathematics, with several tutors and other teachers. It has two colleges—University College, and Bishop Hatfield's Hall. At Newcastle-on-Tyne, but in connection with the univ., are the well-known Colleges of Medicine and of Physical Science. Pop. (1901) 14,679.

DUR'HAM, John George Lambton, Earl of: 1792, Apr. 12—1840, July 28; b. Lambton Hall, co. Durham, England; son of William Henry Lambton. The Lambton estate was not very large, but had been in the possession of the family since the 12th c., the male issue having never failed during all that period. The antiquity of the family, however, exercised no narrowing influence on Durham's opinions, which were markedly radical. He was educated at Eton; and when only 20 years of age, married at Gretna Green Miss Harriet Cholmondeley, who died after a few years. In 1814, he represented his co. in parliament, and though he did not speak on many questions, he took part in all the more important debates, opposing the Corn-law Bill of 1815, the additions made to the incomes of the royal dukes, the Indemnity Bill of 1818, the six repressive bills brought in by govt. to coerce the people after the great reform meeting at Manchester 1819, etc. Two years later he submitted to the house of commons a scheme of parliamentary reform, which of course was not accepted. In 1828, he was raised to the peerage, with the title of Baron Durham of the city of Durham. He was one of the four persons who drew up the Reform Bill, and supported it in the house of lords. In 1833, Lord Durham was dispatched on a mission to Russia. On his return to England, Lord Durham's 'advanced liberalism' was proclaimed at a dinner given to Lord Grey at Edinburgh, 1834, and in various other parts of the country. After a second mission to Russia, he was appointed gov.-gen. of Canada, where he arrived 1839, May; but on account of a misunderstanding with the home govt., he took the extraordinary step of returning to England in half a year, without either being recalled or obtaining the royal consent. Durham died at Cowes, Isle of Wight, leaving a son who succeeded him as Earl of Durham, and three daughters.

DURIAN, or Durion, *dū'rĭ-ŭn* (*Durio zibethinus*): fruit-tree of the Malayan Archipelago, of the nat. ord. *Sterculiaceæ*, of the same tribe or sub-order (*Bombaceæ*) with the silk-cotton tree. It is a lofty tree, with leaves

resembling those of the cherry, and large bunches of pale-yellow flowers. The fruit is of the size of a man's head, roundish oblong, with a hard thick rind, covered with soft spines, so that it somewhat resembles a hedgehog rolled up. The pulp of the fruit is of a sort of creamy substance and delicious taste, but has a smell which is at first very repulsive to Europeans. Persons accustomed to it, however, universally regard the durian as one of the very finest fruits of the East. It brings a higher price than any other fruit in the market in India. It contains 10 or 12 seeds, as large as pigeons' eggs, which, roasted, are not inferior to chestnuts. One tree yields about 200 durians in a year.—The cultivation of the durian has not yet been successful in European and American hothouses, the great size of the tree forming one principal obstacle to it. The durian is not a native of India, nor of Ceylon, but is now successfully cultivated in the latter country.

DURING, prep. *dū'rĭng* [L. *dūrō*, I last or continue]: holding on; in the course of; while anything lasts.

DÜRKHEIM, *dürk'hīm:* town of Rhenish Bavaria, six m. s.w. of Mannheim, at the base of the Hardt Mountains. Many invalids resort to Durkheim on account of its amenity, and to take the *grape-cure.* It has manufactures of tobacco, cutlery, and paper. Not far off are the salt-works of Phillipshall. Pop. (1901) 6,207.

DURLACH, *dûr'lâch:* old town of Germany, grand-duchy of Baden, on the river Pfinz, at the base of the Thurmberg, a highly cultivated hill, 3 m. e. of Carlsruhe. Durlach manufactures linen, tobacco, chicory, vinegar, and machinery, and has extensive fruit and grain markets. The environs abound with orchards. On the summit of the Thurmberg are the ruins of an old castle. Durlach is a station on the Mannheim and Basel railway. Pop. (1901) 11,354.

DUROMETER, n. *dūr-ŏm'ĕ-tĕr* [L. *durus,* hard; Eng. *meter*]: an instrument invented by Behrens, designed for testing the relative hardness of steel rails.

DUROY, n. *dū-roy':* a common quality of woolen serge.

DURRA, *dŭr'ra* (*Sorghum vulgare*): called also *Doura, Indian Millet, Guinea Corn, Ivory Wheat, Pampas Rice, Egyptian Corn,* and various other names. The species is divided into an almost endless number of varieties. Durra bears the smallest grains of the cereals cultivated for food. It is a native of the warmer portions of the old world, and has been under cultivation from time immemorial. The people of central India, Arabia, and large portions of Africa use it as their principal food. Under favorable conditions it throws up large and tall stalks with many broad leaves and large panicles. It has been spread to nearly all parts of the globe, but succeeds best where the summers are long and comparatively dry.

Durra has been known in this country about three-quarters of a century. At intervals of a few years it is

described in glowing circulars, under a new name, as a most valuable grain and forage plant, and unwary purchasers pay high prices for the seed. At some periods it has created considerable interest among practical farmers, and enthusiastic admirers have claimed that it would supplant Indian corn; but its popularity has usually been short-lived and its cultivation has never become general.

To a considerable extent durra adapts itself to circumstances. It grows on a great variety of soils, and in widely different climates, though in our northern states it does not always ripen its seed. In a remarkable degree it has the power of withstanding drought, but on account of the compact nature of the heads it is liable to be injured by rain at harvest time. The seed should be lightly covered, particularly in moist land, or it will be liable to decay. For a while the plant is feeble and needs careful cultivation, but when fairly started it grows rapidly and soon shades the ground so as to smother weeds. Either in a green or dry state the stalks and leaves make excellent fodder. The grain weighs about 60 lbs. per bushel, and 20 to 80 or more bushels can be obtained from an acre of good land. ' The feeding value of the grain is about the same as that of Indian corn. On account of its heavy growth and the weight of the heads it is more difficult to harvest than other grain. It must be cut as soon as ripe, or it will shell profusely in the field. The white varieties yield the largest grain, and are the most popular. The brown or red sorts are little, if any, superior to the seed of brown corn, to which they bear a very close resemblance. Flour made from durra is said to be better for cakes than buckwheat, but inferior to either wheat or corn for making bread. In this country it is not desirable as a plant for human food, but it may be profitably grown for cattle. The Chinese sugar-cane (see SUGAR-CANE) (*S. saccharatum*) is cultivated to quite an extent at the north for syrup and sugar, also for forage.

DURST, v. *dėrst:* see DARE.

DURUY, *dü-rü-ē'*, JEAN VICTOR: 1811, Sep. 11—1894, Nov. 25; b. Paris; historian. Originally meant to be a designer in the lace works at Gobelins, he showed singular aptitude for learned studies, entered the École Normale in his 19th year, and 1833 was a prof. in the college of Henri IV., Paris. In 1863 he was made minister of public instruction, and carried out some important reforms. He was author of numerous important works of history and geography. Among the more important and historical geographies of the Roman Empire, of the Middle Ages, and of France; great histories of Rome, of France, and of Greece; and Sacred History. These works, published 1838-52, appeared partly as sections of the series of works on Universal History of which he was editor. He published numerous minor works; resigned his post 1869; and was made a senator. He held all the distinctions of the Legion of Honor, and was elected to the Academy 1885.

DURYEA, *dŭr-yā′*, Joseph Tuthill, d.d.: 1832, Dec. 9—1898, May 17; b. Jamaica, N. Y.; Congl. minister. He graduated at Princeton Coll. 1856, was tutor of Greek and rhetoric there 1857-8, graduated at Princeton Theol. Sem. 1859, was immediately called to the second Presbyterian Church at Troy, N. Y., where he preached till 1862, was an assoc. pastor of the Collegiate Ref. Church, New York, 1862-68, pastor of the Classon Ave. Presb. Church, Brooklyn, 1868-79, of the Central Congl. Church, Boston, 1879-89 First Congl. Church, Omaha, Neb., 1889. He had a fine philosophical mind, and wide scholarship.

DURYEE, Abram: 1815, Apr. 29—1890, Sept, 27; soldier; b. New York, of Huguenot ancestry. Trained to a mercantile life in New York, he early interested himself in military affairs, joined the state militia 1833, and 1838 became a member of the 27th regt., afterwards the celebrated 'Seventh,' of which he was made col. 1849, holding the office 14 years. At the outbreak of the civil war he raised a regt. called in his honor 'Duryee's Zouaves,' which was succeeded by a second regt. under the same name, both organizations distinguishing themselves during the war.

DURYEE, William Rankin, d.d.: 1838, Apr. 10—1897, June 20; clergyman of the Reformed church: b. Newark, N. J. He graduated at Rutgers College 1856, and at New Brunswick (N. J.) theol. seminary 1861; and was ordained 1862 pastor of the Reformed chh. in Bergen, N. J. Immediately after ordination he entered the Union army as chaplain, and at the end of that service took the pastorate of a Reformed church in Jersey City, N. J. In 1891 he became prof. of moral philos., ethics, and the Eng. Bible in the theol-seminary of the Reformed church, New Brunswick, N. J. He published *Sentinels for the Soul* (1862); and *Our Mission Work Abroad* (1876).

DURYLIC ACID, n. *dū-rĭl′ĭk:* $C_6H_2(CH_3)_3.CO_2H$., a monatomic monobasic acid obtained by oxidizing durene, $C_6H_2.(CH_3)_4$, with dilute nitric acid. It crystallizes in hard prisms, which melt at 302°. By further oxidation, it is converted into cumidic acid, $C_6H_2(CH_3)_2(CO_2H)_2$, which crytallizes in long transparent prisms, and sublimes at high temperatures.

DUSICYON, *du-sĭs′ĭ-on:* genus of *Canidæ*, or sub-genus of *Canis* (dog), consisting of a number of S. American species or varieties, sometimes called Aguara dogs. They have the body rather long in proportion to their height, and of considerable bulk, the muzzle rather sharp, eyes somewhat oblique, and aspect somewhat foxlike, the tail also has a more or less perfect foxlike brush. They are more diurnal than nocturnal in their habits, live in burrows, and feed on birds and small quadrupeds. Some have been domesticated by the Indians.—Akin to the Aguara dogs, but more foxlike, are the Aguara foxes (Cerdocyon, q.v.).

DUSK, n. *dŭsk* [from Eng. *dull:* Sw. *dusk*, dull weather: Dan. *dulsk*, dull, lifeless: Icel. *doska*, to dawdle, to delay]:

a tending to darkness; twilight; state between light and darkness: ADJ. moderately dark; tending to darkness. DUS'KISH, a. moderately dark. DUS'KISHLY, ad. *-lĭ*. DUS'KILY, ad. *-kĭ-lĭ*, with partial darkness. DUS'KINESS, or DUS'KISHNESS, n. approach to darkness. DUS'KY, a. *-kĭ*, partially dark; obscure; gloomy; overcast. DUSKY-PERCH, n. in *ich.*, a species of perch. *Serranus gigas*, belonging to the genus *Serranus*, found on the coasts of France and Spain in the Mediterranean, where it sometimes reaches a weight of 60 pounds. The color of the back is a dark reddish-brown, becoming paler on the belly. Both jaws have very distinct canine teeth.

DUSKY BAY, *dŭsk'ĭ:* large inlet on the s. w. coast of Middle Isle, New Zealand; lat. 45° 40′ s., and long. 166° 20 e. It was entered by Capt. Cook 1769, who here found good anchorage.

DÜSSELDORF, *düs'sĕl-dŏrf* or *dŭs'sĕl-dŏrf:* chief town of the dist. of Düsseldorf, Rhenish Prussia, and cap. of the former duchy of Berg; in a fertile district, on the right bank of the Rhine, at the confluence of the Düssel; lat. 51° 13′ n., long. 6° 45′ e. It was formerly fortified, but its ramparts were converted into gardens and promenades at the treaty of Luneville, 1802. It is in the midst of extensive garden-grounds, and is well built. The streets, the houses of which are built of brick, are regular and spacious; while the rows of trees with which many of them are planted, greatly enhance their appearance. Düsseldorf is divided into the *Altstadt*, on the right bank of the Düssel; the *Karlstadt*, founded 1786, by the Elector Karl Theodore, on the left bank; the *Neustadt*, on the Rhine; and the recently built *Friedrichstadt*, to the south. A colossal equestrian statue of the Elector Johann Wilhelm, who founded a famous picture-gallery here 1710—the pictures of which, however, were removed to Munich 1805—stands in one of the five squares of Düsseldorf. The Düsseldorf Academy was founded 1767, reorganized 1822, and attained great eminence 1822-26, under the management of Cornelius and Schadow. It has had great influence in Europe and the United States: in America its leading exponents have been George H. Hall, Eastman, Johnson, Bierstadt, Leutze; in Germany, Achenbach, Lessing, Tidemann, Baur, Knaus. The acad. has a collection of 14,000 original drawings and sketches by the great masters, and 24,000 engravings. An art exhibition and a steel and iron exhibition were held in Düsseldorf 1880. The principal buildings of Düsseldorf are the old electoral palace; the present palace, the residence of the gov. of the province; the govt. house, the observatory, town-hall (built 1567), theatre, gymnasium, and public library. Of the ecclesiastical edifices, the most remarkable are the churches of St. Andrew and St. Lambert, and the church of the Jesuits, a handsome and highly ornate structure, having two steeples. The Hofgarten, one of the finest public gardens in Germany, is a very agreeable promenade. Düsseldorf has manufactures of

woolens, cottons, leather, hats, tobacco, jewelry, mirrors, railway-carriages, etc., and its trades and industries generally are steadily advancing. A great part of its importance may be said to be derived from its position on the Rhine, where it receives great quantities of goods from the surrounding districts for exportation. With the duchy of Berg, Düsseldorf came into the possession of Prussia 1815. It was made a free port 1829, and since that time has prospered. Industry and commerce have received a new impulse since Düsseldorf became the central point of several lines of railway. Pop. (1900) 213,767.

DUST, n. *dŭst* [Icel. *dust;* Gael. *dus*, dust: Dan. *dyst*, fine flour, meal: Dut. *donst*, vapor, flour: Ger. *dunst*' vapor]: particles of matter so fine and dry that they may be raised and scattered by the wind; fine powder; earth; mortality; death; a low or mean condition: V. to free from dust; to sprinkle with flour or powder. DUST'ING, imp. DUST'ED, pp. DUST'ER, n. one who, or that which; a towel or napkin for dusting: N. a light overcoat worn to protect the clothes from dust; a dust coat. DUSTY, a. *dŭs'tĭ*, covered with dust; pertaining to dust; in *bot.*, covered with minute dots, as if dusted, as the calyx and corolla of *Ardisia lentiginosa*. DUS'TINESS, n. *-nĕs*, state of being dusty. DUST-BIN, a receptacle for the temporary disposal of dust, ashes, and refuse. DUST-BRAND: see SMUT. DUST-BRUSH, a light feather or hair brush for removing dust from furniture, etc. DUST-CART, a cart employed to take away rubbish and refuse from dwelling-houses. DUST-HOLE, an ashpit. DUST-MAN, a scavenger, one employed to take away dirt and refuse. DUST-PAN, a broad flat shovel for taking away dust from an apartment. DUSTY-MILLER, or DUSTY-MILNER, n. in *bot.*, *Primula auricula*, from its white powdery appearance. TO BITE THE DUST, to fall or be thrown, as in a contest or battle; to suffer humiliation. TO KICK UP A DUST, in *familiar language*, to make a disturbance. TO THROW DUST IN ONE'S EYES, to confuse; to bewilder; to deceive.

DUST, COSMIC or METEORIC: fine particles filling vast regions of the atmosphere. The constant presence of dust in the air may be demonstrated by the familiar experiment of admitting a beam of sunlight into a dark room. The path of the beam becomes plainly visible owing to the reflection of the light by the myriad particles floating about. Were the air quite pure of course nothing of the kind would be seen. To prove that dust exists also in the open air, if we cover a plate with a thin coating of glycerine and expose it to a strong wind, numerous particles of matter will be found deposited on its surface Examined with the microscope, these prove to be pollen-grains from flowers, bits of vegetable fibres and hairs, mineral and rocky fragments of all kinds, and *iron*. The presence of vegetable and mineral particles is easily explained; but not so the iron.

Showers of dust are not uncommon near active volcanoes. Mr. Whymper witnessed an eruption of Cotopaxi, in which dust and ashes calculated to weigh about two million tons were thrown into the air. But dust-showers of other than volcanic origin have frequently been observed both in ancient and in modern times. Nordenskjöld found particles of metallic iron and nickel in the snow at Stockholm in 1871, on the Polar ice, and in 1883 in Greenland. Hailstones have sometimes been found to have a metallic nucleus of iron pyrites. Glycerined plates exposed to the winds have had iron particles deposited on them. Dr. Reichenbach, of Vienna, has shown that the dust which covers the tops of mountains and other elevated places contains metallic particles. Magnetic dust was found by Mr. Murray, of the *Challenger*, in the dredgings of the sea-bottom. According to Professors Newton and Young, 100 tons of meteoric stones on an average are daily dissolved to dust in our atmosphere.

Arago said in 1832: 'The attentive observation of falls of dust renders it presumable that they are not essentially different from those of the ordinary aërolites.' In this opinion he has been followed by Reichenbach, Nordenskjöld, Silvestri, and Tissandier.

The main argument for the cosmic or extra-terrestrial origin of such dust is the similarity of its composition to that of meteoric stones (aërolites), though sometimes the dust differs materially from the constituents of an aërolite. Another reason is, that the fall both of aërolites and of showers of non-volcanic dust seems generally preceded by a fire-ball or luminous meteor. Many of the best authorities believe that *comets* are the source of our meteoric phenomena—shooting stars, fireballs, aërolites, and (if the theory above noted be true) meteoric or cosmic dust. Meteors seem to be due to the earth passing through rings of matter which revolve round the sun in cometary or elliptic orbits, the larger masses of this matter reaching the earth as aërolites, and the smaller ones being frittered into dust by the resistance of the air. See METEORS.

A contrary opinion is adopted by Prof. Tacchini of the Collegio Romano in Rome, who has analyzed the dust which fell in various parts of Sicily and Italy 1879. The dust was borne on the sirocco, a dry wind from the African desert. The examination revealed the presence of the usual constituents—as granules of metallic iron, nickel, cobalt, phosphorus, magnesia, etc. His theory is: Whirlwinds and cyclones in the Sahara raise quantities of dust into the higher regions of the atmosphere; it there remains suspended for several days until transported across the Mediterranean; then a small descending cyclone—the cause of the barometric depression—brings it to the surface of the earth. And he thinks that Nordenskjöld's discovery of native iron in Greenland justifies the belief that it may occur in the dust of the Sahara. But no supporter of the theory of terrestrial origin for the dust has explained the fact that the iron particles found in it are particles of mete-

oric iron as distinguished from any terrestrial iron known to us. Meanwhile, therefore, the cosmic origin seems most probable.

DUSTEE, *dôs'tē:* largest river of Beloochistan, enters the Arabian Sea, in lat. 25° 3′ n., and long. 61° 45′ e. In proportion to length, it is certainly the least considerable stream in existence. It is about 1,000 m. long; and yet it has been found to be at its mouth, 20 inches deep. and 60 ft. wide. During its entire course, it is, in its permanent character, remarkably shallow; and, in fact, all the water-courses of the country depend almost exclusively on the rainy season.

DUS'TY-FOOT: court of summary jurisdiction established at fairs in England for the speedy determination of questions arising between those who resorted to the fair. See PIEPOWDER COURT.

DUTCH, v. [etym. doubtful]: to clarify and harden by immersing in heated sand, as goose-quills. DUTCHING, n.

DUTCH, a. *dŭch* [Ger. *deutsch—lit.*, belonging to the people]: pertaining to Holland—its language or inhabitants; in many compounds, false, unreal. DUTCH-AGRIMONY, in *bot.*, *Eupatorium cannabinum.* DUTCH-AUCTION, a false or mock auction in which the salesman begins with a high sum, gradually naming less sums till the minimum is reached. DUTCH-BEECH, n. in *bot.*, *Populus alba.* DUTCH CASE, n. in *mining,* a shaft-frame composed of four pieces of plank, used in shafts and galleries; a mining case. DUTCH-CLINKERS, long narrow bricks from Holland, very hard, and appearing as if vitrified. DUTCH CLOVER, n. in *bot.*, *Trifolium repens*, also called white clover. DUTCH CONCERT, n. a so-called concert in which every man sings his own song at the same time that his neighbor is also singing his. There is another form of Dutch concert, in which each person present sings in turn one verse of any song he pleases,some well-known chorus being used as a burden after each verse. When every person has sung his song, all sing their respective songs simultaneously as a grand *finale.* DUTCH-COURAGE, courage excited by stimulants. DUTCH-GOLD, alloy of copper and zinc, in the proportion of three or four ounces of zinc to one pound of copper. It can be beaten out into thin leaves resembling gold-leaf, when it receives the name of *Dutch gold-leaf,* or *Dutch-foil,* and almost rivals gold in appearance. Dutch-gold, called sometimes *Dutch-mineral* or *-metal,* is very liable to be tarnished by gases, such as hydrosulphuric acid (sulphureted hydrogen), which are constantly present in the air, especially in town districts, and it may be distinguished from true gold-leaf by the action of strong nitric acid, which instantly dissolves Dutch gold, but leaves true gold unaffected. DUTCH-LIQUID, oily substance obtained by mixing chlorine and olefiant gases, which combine and yield Dutch-liquid with the formula $C_2H_4Cl_2$. It has a specific gravity of 1280 (water = 1000), boils at 184° F., is not miscible with water, but dissolves readily in ether and alcohol. It

possesses the power of producing anæsthesia (q.v.), as chloroform (q.v.) does; but the great difficulty of preparing it in commercial quantities must retard its employment as an anæsthetic. Dutch medlar, n. in *bot.*, *Mespilus germanica*. Dutch mice, n. in *bot.*, *Lathyrus tuberosus*. Dutch morgan, n. in *bot.*, *Chrysanthemum leucanthemum*. Dutch myrtle, n. in *bot.*, *Myrica Gale*, a fragrant shrub belonging to the order *Myricaceæ*. It is found in bogs and moors, and is in some parts used for making an infusion like tea. Dutch oven, n. a spider, skillet, or camp oven used to cook by hot coals on the hearth; a cooking-chamber suspended in front of a fire so as to cook by radiation. Dutch pink, n. chalk or whiting dyed with a decoction of birch-leaves, French berries, and alum. Dutch pink, English and Italian pinks, are bright yellow colors used in distemper and for paper staining and other ordinary purposes. The pigment called 'stil' or 'stil de grain' is a similar preparation, and a very fugitive yellow, the darker kind of which is called brown pink. Dutch roots, n. in *bot.*, *Hyacinthus nūtans*. Dutch-rushes, the stems of Equisetums imported from Holland, used for polishing: see Equisetum.—Dutch language and literature: see Netherlands. Dutch school of painting: see Painting. Dutch scoop, n. a box shovel suspended by cords from a tripod and used for irrigation. Dutch white, n. in *com.*, a mixture of lead carbonate and barium sulphate, sold as a white pigment.

DUTCH IN THE UNITED STATES: Holland's one effort at colonizing the northern New World was along the coast strip between the Hudson and Delaware (then known as North and South Rivers). Thence they penetrated inland, striking first of all up the Hudson to Albany, to establish fur-trade with the Indians, and thence westward to Schenectady; spreading east and west from New Amsterdam (New York), to the Connecticut settlements and on Long Island and into New Jersey. They made a grasp at the Connecticut River, but were soon driven off it. The Delaware was fiercely contested with them by the Swedes, who left a strong impress there, but in vain; and the western side of New Jersey has considerable Dutch blood and settlement as well as the east, with not a little in Pennsylvania and Delaware. The English took all their possessions from them in 1664, but of course did not root out their blood or traditions. The contribution of the Dutch to American institutions has been the subject of keen debate. Enthusiastic writers have credited them with pretty much everything distinctive of American institutions; partly and largely through the residence of the Pilgrims in Holland, it being assumed that the Pilgrims were unable to originate even such primitive ideas as that of confederations for protection except by imitating Holland; partly through the study of their institutions by the statesmen of the Constitution period. Democracy and religious freedom, written constitutions and the ballot, free religion and free schools, equal inheritances and state recording

of deeds, have all been traced to their example. Some influence on the Pilgrims is more than probable, especially in technicalities like the recording of deeds; and in the form of some few others there are significant similarities. But the wholesale character of their advocates' claims injures their cause. Democracy and equal inheritances were the result of the nature of the settlements; free schools existed among the Huguenots as well as the Dutch, and the people colonized on the basis of religious exposition of a book must train children to understand that book; the ballot is centuries older than Holland, and a written federal agreement was needed as security for its being kept. The extreme view is taken by Douglas Campbell, *The Puritan in Holland, England, and America*(1892); a more moderate one by John Fisk, *The Dutch and Quaker Colonies in America* (1899).

DUTCH REFORMED CHURCH: see REFORMED CHURCH IN AMERICA.

DUTEOUS, a. *dū'ti-ŭs* [from DUTY, which see]: obedient; fulfilling duty. DU'TEOUSLY, ad. *--lĭ*. DU'TEOUSNESS, n. *-nĕs*. DUTIFUL (see DUTY).

DUTIES, CUSTOMS-: see CUSTOMS-DUTIES: FREE-TRADE: TARIFF, PROTECTIVE; ETC.

DUTROCHET, *dü-tro-shā'*, RENE JOACHIM HENRI: 1776, Nov. 14—1847, Feb. 4; b. at the Château de Néon (Poitou); French physiologist and physician. His works are full of new ideas, but is known best by his researches on the passage of fluids through animal and vegetable substances: see ENDOSMOSE: DIFFUSION OF LIQUIDS AND GASES.

DUTTEEAH, *dŭt'tē-a:* city of Bundelcund, central India, 125 m. s.e. of Agra. Pop. abt. 30,000.

DUTTON, SAMUEL TRAIN, American educator; b. Hillsboro, N. H., 1849, Oct. 16. He was graduated at Yale, 1873, and was superintendent of schools in Brookline, Mass., 1890–1900. He was a lecturer on pedagogy at Harvard, 1895–7; Chicago University, 1897; Vassar College, 1897–8; and Boston University, 1898. In 1900 he was appointed professor of school administration, and superintendent of Teachers' College School, in connection with the Teachers' College of Columbia University. He has written: *Social Phases of Education*, and several school text-books.

DUTY, n. *dū'tĭ* [from Eng. *due:* It. *dovuto;* OF. *deuté*, duty, right; F. *dû*, duty]: the obedience which one owes to another, as to a parent or superior (see ETHICS); that which a person is bound to pay, do, or perform; tax, impost, or toll, service; business. DU'TIABLE, a. *-ă-bl*, in *commerce*, liable to duty or duties. DU'TIFUL, a. *-fûl*, respectful; obedient, as to parents or superiors; required by duty. DU'TIFULLY, ad. *-lĭ*. DU'TIFULNESS, n. SYN. of 'dutiful': obedient; submissive; duteous; reverent; reverential; deferential.

DUTY.

Duty, in *Ethics:* The aspect of conscience which insists that whatever we see to be right and feel to be good should be carried out as a voluntary act. Duty is suggestive simply and not compulsory. Conscience informs us of the relative values of action as these are measured by the resources of our human nature and by the necessities of our concrete circumstances. The act which is found by such evaluation to be most fitting realizes an impulse of greater or less strength to its performance according as our habits have been formed in accordance with or in contradiction to previous deliverances of conscience. The impulse of duty is an appeal to individual choice and not a mandate to be carried into action without regard to individual consent. Hence in the development of moral beings, inclination and duty frequently conflict, and according as an individual of himself chooses to guide inclination in accord with duty or wills to submerge duty in inclination, is character formed into virtuous or vicious habits. Where habits have been thoroughly established, there is usually no conflict between duty and inclination. In the thoroughly good man, inclination by very habit merges itself in duty; in the thoroughly bad man, duty is so absorbed in inclination as to get no recognition whatever. Thus as the insistence upon the voluntary expression of a conscientiously determined act in overt deeds, duty is the last stage of a complex and self-conscious measurement of human conduct. Aside from our human ability to forecast our conduct immediately and to have in mind before it is carried out, a definite idea of what we are going to do, we have also the power through memory of the consequences of previous acts, to see our proposed deed not only in its immediate bearings, but also in its broader relations as these are interpreted to us by the past course of our lives. The ability thus to organize conduct realizes itself in the phenomenon of conscience, which is nothing else than this, that the organised insights, appreciations, and inclinations of our whole lives are put at the disposal of any single moment for the illumination and evaluation of that moment. Hence, if an act after having been measured by the standards of conscience is realized in the form desired by concience, it is an act of duty *i.e.* an act done as it should be done. If, on the other hand, it is done otherwise, it is an act of disobedience *i. e.* an act done as it ought not to be done. A man's duty is thus measured in several ways. It must be an act fitted to his exact circumstances *i. e.*, one which is practicable. It must be one done freely and in accordance with his own best experience. Hence, duty never can mean absolutely the same thing to any two individuals. For on the one hand the life circumstances of two individuals are never the same and on the other hand what circumstances mean to different individuals is never the same, for past experience is different in each case *i. e.* powers of insight, fineness of emotional appreciation, habits of conduct, temperament, education, range.

and organization of experience is different even with regard to those individuals who on the surface appear to be most alike.

DUUMVIR, n. *dū-ŭm′vĭr,* Duum′viri, n. plu. *-vĭr-ī*[L. *dŭŏ,* two; *vir,* a man]: in *anc. Rom,* one of two united in the same public office appointed usually for some special magistracy or command. Duum′virate, n. *-vĭ-rāt,* two men united in the same office; the office itself. Duum′viral, a. *-vĭ-răl,* pertaining to a duumvirate.

DUVET, n. *dō′vĕt* [F. *duvet,* down, wool, nap]: a down coverlet or quilt.

DUX, n. *dŭks* [L. *dux,* a leader]: in *Scot.,* the head or chief pupil of a class or division, in a public school.

DUXBURY, *dŭks′bĕr-ĭ:* town, Plymouth co.,Mass.; 9 m. n. of Plymouth, 27 m. s.s.e. of Boston; on a bay of the Atlantic Ocean, at junction of Old Colony and Duxbury and Cohasset railroads. Gurnet peninsula, 6 m. long forms the n.e. boundary of the harbor, and has two fixed lights at its extremity. The ocean cable from Brest, France, terminates here. Duxbury was the residence of the Puritan soldier, Miles Standish, and has a hill 180 ft. high bearing his name. It contains Partridge Acad., abt. 12 public high and grammar schools, and several churches. The inhabitants are engaged in general commerce, fishing, and ship-building. Pop. (1900) 2,075.

DUXITE, n. *dūks′īt:* a resin occurring in a smaller layer 25 to 75 millimetres thick, on the lignite of Dux in Bohemia.

DUYCKINCK, *dī′kĭnk,* Evert Augustus: 1816, Nov. 23—1878, Aug. 13; b. New York: author. He graduated at Columbia College 1835; was admitted to the bar 1837; was joint editor and publisher of *Arcturus,* a monthly periodical, 1840–42; conducted with his brother *The Literary World* 1847–53; compiled with his brother *The Cyclopædia of American Literature,* 2 vols. (1855, enlarged and revised 1865, 75); prepared memorials of Francis L. Hawks (1867), Henry T. Tuckerman (1872), John Wolfe (1872), Samuel G Drake (1876), and James W. Beeckman (1877); collected *Poems Relating to the American Revolution, with Memoirs of their Authors* (1865); and wrote a *History of the War for the Union*(3 vols. 1861–65), *National Gallery of Eminent Americans* (2 vols. 1866), and *Biographies of Eminent Men and Women of Europe and America* (2 vols. 1873–4). For some time prior to his death he was associated with William Cullen Bryant, who died less than two months before him, in the preparation of an edition of Shakespeare.—His brother, George Long Duyckinck (1823, Oct. 17—1863, Mar. 30), graduated at the Univ. of New York 1843, was admitted to the bar, but like Evert never practiced. Besides assisting his brother, he began publishing a series of lives of English clergymen, and brought out those of *George Herbert* (1858), *Bishop Thomas Ken* (1859), *Jeremy Taylor* (1860), and *Hugh Latimer* (1861), and was engaged on that of *Bishop Leighton* at the time of his death.

D-VALVE, n. [so called from its shape]: in *mach.*, a species of side-valve, employed chiefly in the steam-engine, and adapted to bring each steam-port alternately in communication with the steam and exhaust respectively.

DVORAK, *dvōrsh-ăk'* ANTONIN: 1841, Sep. 8—1904, May 1; musical composer: b. Nelahozeves, Bohemia. The village school-master gave him lessons in violin-playing, of which Dvorak made such profit that at the age of 16 he found employment as violinist in an orchestra at Prague; at the same time he attended the school of the organ there conducted by Pitzsch. On completing his studies under Pitzsch he won the second medal for proficiency, and found employment in the orchestra of the national theatre. The first public performance of a composition by Dvorak was in 1873, when a hymn for male and female voices, with orchestral accompaniment was rendered. The success was decisive, and thereafter Dvorak giving up his situation in the theatre, devoted himself wholly to composition. His dances, songs, and symphonies found favor with the best critics and won great popularity at home and abroad. He came to America 1892 under contract to be director for three years of the National Conservatory of Music, New York. He died at Prague, Bohemia.

DWARF, n. *dwawrf* [AS. *dweorg;* Icel. *dvergr;* Sw. *dwerf*, a dwarf: Skr. *dhvaras*, a female fairy]: any animal or plant much below the usual size; a man or woman much under the ordinary height; a page or attendant on a knight in olden times (see GIANTS AND DWARFS): V. to hinder from growing to the natural size. DWARF'ING, imp. making or keeping small. DWARFED, pp. *dwawrft.* DWAR'FISH, a. *-fĭsh*, like a dwarf; very small DWAR'FISHLY, ad. *-lĭ.* DWAR'FISHNESS, n. DWARF-BAY, n. in *bot.*, *Daphne mezereum; Daphne Laureola.* DWARF-CORNEL, n. in *bot.*, a common modern book-name for *Cornus suecica.* DWARF-ELDER, n. in *bot.*, *Sambucus ebulus; Ægopodium pobagraria.* DWARF-HONEYSUCKLE, n. in bot., *Cornus succica.* DWARF-MALE, n. in *bot.*, the antheidium of an algæ. DWARF-MALLOW, n. in *bot.*, *Malva rotundifolia.* DWARF-PALM, n. in *bot.*, a genuine palm *Chamærops humilis; Opuntia vulgaris.* In this second case Dwarf-palm is an entire misnomer, the plant being a cactus, with no affinity or even analogy to the order *Palmaceæ.* DWARF RAFTER, n. in *carp.*, little jack; a short rafter in the hip of a roof. DWARFS are described by several ancient classical writers. Herodotus gives an account of a race of dwarfs living in Libya and the Syrtes, to which Aristotle and Pliny also refer. Henry M. Stanley in his journey across Africa in 1888, came on a dwarfish race which he thought might be decended from that mentioned by Herodotus. Philetas of Cos, distinguished about 330 B.C. as a poet and grammarian, was jocularly said to have carried weights to prevent his being blown away. He was preceptor to Ptolemy Philadelphus. Julia, niece of Augustus,

had a dwarf named Coropas, two feet and a hand's breadth high; and Andromeda, a freemaid of Julia's, was of the same height. The best known of modern dwarfs was Charles S. Stratton, or, as he was popularly called, Tom Thumb, who was 31 inches high at the age of 25. He was born in Bridgeport, Conn., and travelled extensively abroad and at home under the management of P. T. Barnum. Wherever he went he attracted great attention, even from such personages as Queen Victoria and Napoleon III. Another modern dwarf was Francis Flynn, Gen. Mite, who was 21 inches in height at 16 years.

In Scandanavian mythology dwarfs (*Dvergar*) are inhabitants of the interior of the earth, and especially of large isolated rocks. They were imagined to be dark in aspect like the caverns in which they dwelt, and were often styled dark elves. A dwarf was set by the gods at the corner of each of the four quarters of the earth to bear up the sky; and they were named East, West, North, and South. All the dwarfs were esteemed great artists in working metals, and weapons of marvelous properties were said to be produced from their subterranean workshops. Like the Jotuns, they could not endure the sunlight, and if its rays touched them they were turned into stone. If a man met a dwarf away from his rock, and could throw steel between him and it, it was believed that thereby his habitation was closed up, and that any thing in his power could be extorted from him. In the old Norse, echo is called 'dwarf language,' probably because it was thought to be produced by the dwarfs within mountains, imitating the sounds which they heard without. See DEFORMITY.

DWARFED TREES, growing in flower pots: characteristic ornament of Chinese and Japanese houses and gardens, and the production of them is an art which has been carried to great perfection. It depends upon the prevention of an abundant flow of sap, so that while the tree is kept living and healthful, vegetation does not go on with its natural activity. The trees are planted in shallow and narrow flower-pots; care is taken that their roots never pass into the ground beneath; are very sparingly supplied with water; their strongest and leading shoots are pinched off, and their branches are bent and twisted in various ways. A very extraordinary dwarfing is the result of these and other such processes; and the dwarfed trees not unfrequently abound in flowers and fruit.

DWARFED FRUIT TREES: see ORCHARD: ORCHARD HOUSE.

DWARKA, *dwâr'kâ:* maritime town, province of Guzerat, India, on the w. side of the peninsula of Kattywar; lat. 22° 15′ n., and long. 69° 1′ e. It is one of the most sacred places in this part of Hindustan. On an eminence over-hanging the sea-shore, which was once an islet, stands a great temple of Krishna, presenting to the mariner a conspicuous landmark; and connected therewith by a colonnade, is a smaller edifice dedicated to Deoki, the

mother of Krishna. The Gumti, a bordering rivulet which barely reaches the ankle, is, notwithstanding its insignificance, an object of profound veneration. Pop. 5,000.

DWAY-BERRIES, n.: in *bot.*, *Atropha Belladonna.*

DWELL, v. *dwĕl* [Dut. *dwaelen*, to go about, as opposed to going straight: AS. *dwelian*, to deceive: Icel. *dvelia*, to hinder: Dan. *dvœle*, to dwell, to linger]: to live in a place; to inhabit; to reside; to abide for a time; to continue long; to linger on with affection. DWEL'LING, imp.: N. a place of residence; a habitation. DWELT, pt. and pp. *dwĕlt*. DWEL'LER, n. one who. DWELLING-HOUSE, a settled residence. DWELLING-PLACE, a residence; a place of abode. TO DWELL ON or UPON, to occupy a long time with; to continue on, as to dwell on a subject.—SYN. of 'dwell': to abide, sojourn; continue; rest; stay; live; remain.

DWIGHT, *dwīt*, EDMUND: 1780, Nov. 28—1849, Apr. 1; b. Springfield, Mass.: merchant. He graduated at Yale College 1799; studied law, but became a merchant; and founded the mercantile firm 1815 which established the villages of Chicopee Falls (1822), Chicopee (1831), and Holyoke (1847). He was a member of the legislature many years, a founder of the American Antiquarian Soc. 1812, author of the present system of normal schools, to establish which he gave $10,000, and a founder of the Mass. state board of education.

DWIGHT, HARRISON GRAY OTIS, D.D.: 1803, Nov. 22—1862, Jan. 25; b. Conway, Mass.: missionary. He graduated at Hamilton College, N. Y., 1825, and at Andover Theol. Seminary 1828, and was ordained and appointed a missionary of the A. B. C. F. M. 1829, July 15. After spending over a year in exploring Asia Minor, Persia, Armenia, and Georgia, he made Constantinople the base of his operations and founded the Armenian Mission there. He was remarkably successful as a missionary, wrote several books and tracts and translated a portion of the Bible into various oriental languages, published *Researches of Smith and Dwight in Armenia*, *Memoir of Mrs. Elizabeth B. Dwight*, *Christianity Revived in the East*, and *A Complete Catalogue of Literature in Armenia.* He lost his life in a railroad accident in Vt. while revisiting his native country. He received the degree D.D. from Hamilton College 1852.

DWIGHT, SERENO EDWARDS, D.D.: 1786, May 18—1850, Nov. 30; b. Greenfield Hill, Conn.: educator. He graduated at Yale College 1803, was tutor there 1806-10, practiced law in New Haven 1810-16, was licensed to preach 1816, chaplain in U. S. senate 1816-17, and pastor of the Park Street Cong'l Church, Boston, 1817-26. Returning to New Haven he engaged in literary work and teaching till 1833, when he was elected pres. of Hamilton College, but continued ill-health caused him to resign 1835. His published works comprise *Life of David Brainard* (1822), *Life and Works of Jonathan Edwards*, (10 vols.

1830), *The Hebrew Wife* (1836), and a memoir of his father, Pres. Timothy Dwight, and sermons and addresses. He received the degree D.D. from Yale College 1835.

DWIGHT, THEODORE: 1764, Dec. 15—1846, July 12; b. Northampton, Mass.: journalist. He was a cousin of Judge Pierrepont Edwards and of Aaron Burr, and practiced law some time with eminent success. Removing to Hartford he edited *The Courant* and *The Connecticut Mirror* in the interest of the federalist party; was a member of congress 1806-7, of the state council 1809-15, and sec. of the Hartford convention 1814; and founded and edited *The New York Daily Advertiser* 1817-36. He was author of a *History of the Hartford Convention* (1833), and *Character of Thomas Jefferson, as exhibited in his own Writings* (1839).

DWIGHT, THEODORE WILLIAM, LL.D.: 1822, July 18—1892, June 29; b. Catskill, N. Y. He graduated at Hamilton College, N. Y., 1840; studied law at Yale College 1841-2; was tutor at Hamilton College 1842-46; and prof. of law, history, and political economy there, 1846-58; was elected prof. of municipal law in Columbia College, New York, 1858; and was soon afterward appointed warden of the newly-organized law school, which office he held till 1891. In 1867 he was a member of the N. Y. constitutional convention; 1868 became non-resident prof. of constitutional law in Cornell Univ.; 1869 lecturer on the same branch in Amherst College; 1873 vice-pres. N. Y. state board of public charities and judge of the special commission of appeals; 1874 pres. of the N. Y. State Prison Assoc. and member of the 'committee of seventy' citizens chosen to secure municipal reform; and 1886 counsel for the professors of Andover Theol. Seminary who were charged with heterodoxy. Prof. Dwight has been an assoc. editor of the *American Law Register* many years, edited Henry S. Maine's *Ancient Law* (1864), and published numerous legal treatises and arguments. He received the degree LL.D. from Rutger's College, N. J., 1859, and Columbia College, 1860.

DWIGHT, *dwīt*, TIMOTHY, D.D., LL.D.: 1752, May 14—1817, Jan. 11; b. Northampton, Mass.: theologian, pres. of Yale College. He studied at Yale and was licensed as a Congl. preacher 1777. During the War of Independence, he was for some time chaplain in the American army. In 1783, he was ordained minister of the Congl. church, Greenfield, Conn., where he also conducted an academy for 12 years with distinguished success. In 1787 the College of Princeton, N. J., conferred on him the degree D.D.; and 1795, he was elected pres. of Yale College and prof. of divinity. Dwight's principal work is his *Theology Explained and Defended in a series of* 173 *Sermons* (5 vols. Middletown, Conn. 1818, etc.). It has been frequently reprinted in England; and has had great popularity in the U. S. and Great Britain. It is an excellent presentation of the moderate type of Calvinism which has prevailed

in New England. Dwight was not a great original thinker; but his mind was fertile in apt and useful ideas, and was systematic in its working; his style was clear; he was impressive and eloquent as a preacher, and highly successful as an instructor. Among his writings were *The Conquest of Canaan, an Epic Poem* (1785); *Travels in New England and New York* (1821), reckoned by Southey the most important of his writings; and two vols. of *Sermons* (Edin. 1828).

DWIGHT, Timothy, d.d., ll.d.: b. Norwich, Conn., 1828, Nov. 16; grandson of President Timothy Dwight of Yale College (1752, May 14—1817, Jan. 11); he graduated at Yale College 1849, studied in its theol. school till 1853, was tutor in the college 1851-55, licensed as a Congl. preacher 1855, May 22, continued his studies in the universities of Bonn and Berlin 1856-58, and, returning to the United States in the latter year, was appointed Buckingham prof. of sacred literature and N. Test. Greek in Yale Theol. School. He was ordained a Congl. minister 1861, Sep. 15, was a member of the American committee for the revision of the Bible 1378-85, and succeeded Noah Porter, d.d., ll.d., as president of Yale University 1886. He has been a contributor to the *New Englander* magazine many years, and one of its editors, and published in it (1870-1) a notable series of articles on *The True Ideal of an American University*, which was subsequently republished and widely circulated. President Dwight is a believer in a well-balanced application of the elective system, liberal in his ideas of a univ. course, popular among the students, an engaging speaker, a profound scholar, and an incessant worker. Having ample private means, he gave his salary as prof. to the theol. school regularly for several years. He annotated the English translation of Meyer on *Romans* (1884), *Philippians, Philemon, Timothy, Hebrews,* and translated and annotated Godet on the *Gospel of John* (1886). He received the degree d.d. from the Chicago Theol. Seminary, 1869, and ll.d. from Harvard Univ. 1886.

DWIGHT, William Buck, American geologist: b. Constantinople, Turkey, 1833, May 22; d. Cottage City, Mass., 1906, Aug. 29. He was a son of H. G. O. Dwight (q.v.). He was graduated at Yale in 1854, at the Union Theological Seminary, New York, in 1857, and at the Yale Scientific School in 1859. He filled several educational posts in a scientific capacity, and since 1878 was professor of natural history and curator of the museum at Vassar College. In 1891 he invented and patented a rock-slicing machine for the scientific section of minerals, for which he was awarded a bronze medal at the Paris Exposition of 1900.

DWINA, *dwē'na* or *dwī'na*, Northern—as distinguished from the Western Dwina or Düna (q.v.): important river of Russia. It has its origin in the confluence of the Suchona and the Jug, two streams, the latter more than 200

m., and the former nearly 300 m. in length, rising in the south of the province of Vologda, and uniting in lat. 60° 45′ n., long. 46° 30′ e. The Dwina, from the union of these streams, flows n. about 50 m., and receives the Vytchegda from the e., a river 500 m. long. At this point, the Dwina becomes navigable, and here it alters its direction, and proceeds n.w. toward the Gulf of Archangel, into which it flows, having been joined on the right by the Pinega, and on the left by the Waga, and having traversed a course of about 700 m. Its basin comprises 123,900 sq. m. Its average width is from 500 to 600 ft.; before debouching into the White Sea, however, its surface, there marked by many islands, increases in width to about four miles. The waters of the Dwina, the largest river that falls into the White Sea, abound with fish. Large vessels cannot enter the Dwina, on account of the shoals at its mouth.

DWINDLE, v. *dwĭn′dl* [AS. *dwinan;* Low Ger. *dwanen,* to fade, to vanish: Icel. *dvina,* to diminish]: to become less; to lose bulk; to shrink; to consume or waste away; to degenerate. DWIN′DLING, imp. DWINDLED, pp. *dwĭn′dld.* DWINE, v. *dwīn* [DWINDLE may be dim. of DWINE]: in *prov. Eng.,* to waste away; to pine. DWI′NING, imp. DWINED, pp. *dwīnd.*

DYAD, n. *dī′ăd* [Gr. *dŭăs,* two]: in *chem.,* a bi-equivalent; an element of two equivalents; a molecule which can combine with two monad atoms. DYADIC ARITHMETIC, n. a system of notation in which only two figures, 1 and 0 are used; thus 2 is represented by 10, 3 by 11, 4 by 100, 9 by 1001.

DYAKS, n. plu. *dī′ăks,* or DAJAKS, n. plu. *dā′yăks:* a people of Borneo, a large island of the East Indian archipelago: see BORNEO.

DYAUS, n. *dī′ŭs* [Skr.]: a divinity of the Vedas, the god of the sky, and hence of rain. The name is the same as the Greek Zeus, and Latin Jupiter.

DYCE, *dīs,* ALEXANDER: 1798, June 30-1869; b. Edinburgh: English literary historian. He was educated at the High School of Edinburgh, and at Oxford. After officiating for some time as curate, he settled in London 1827. His literary reputation is based chiefly on his editions of the older English poets and authors—George Peele, Robert Greene, John Webster, Shirley, Thomas Middleton, John Skelton (an author in the beginning of the 16th c., previously little known), Beaumont and Fletcher, Ford, and Marlowe, with biographies of the authors, and instructive notices. He also edited the poems of Shakespeare, Pope, Akenside, and Beattie, for Pickering's Aldine Edition of the Poets. An old play discovered by him, called *Timon,* and which may possibly have first suggested to the great poet the idea of his drama of the same name, was published for the Shakespeare Soc., also another entitled *Sir Thomas More.* In conjunction with Collier, Halliwell, and Wright, Dyce founded the Percy Soc. for the publication of old English ballads, plays, and poems. His ability as a com-

mentator on Shakespeare is proved by his *Complete Edition of the Works of Shakespeare; the Text revised; with Account of the Life, Plays, and Editions of Shakespeare, Notes, etc.* (1858.)

DYCE, WILLIAM, R.A.: 1806-64; b. Aberdeen, Scotland: painter. He was educated at the Univ. of Aberdeen, and at the age of 16 took the degree master of arts. After acquiring the rudiments of his art-education he went to Rome, where he studied for some years. His tendency at first was very strongly, and continued so under certain modifications, toward early Italian, or pre-Raphaelite art, and his productions attracted the marked attention of Overbech, head of the modern German school. Returning from Rome, he settled in Edinburgh, where, besides painting portraits, he contributed largely to the exhibitions. The first picture that he exhibited in Edinburgh was in the Perugino style, and though evincing great power, was at that period, 1829, but little appreciated; his *Puck*, however, exhibited at the same time, was very successful, and most of his after-contributions to the exhibitions of the Royal Scottish Acad., of which he was a member, were deservedly popular, particularly his picture of *Francesca da Rimini*, 1837. After this he went to London, to be head-master of the New School of Design at Somerset House, an office which he held for three years. Soon after this he was appointed prof. of painting in the London University. He distinguished himself at the Westminster competition by his frescoes, and in consequence was one of the artists selected to decorate the Palace of Westminster and the House of Lords; and at Osborne House several works in fresco were executed by him. Dyce was elected an assoc. of the Royal Acad. 1844, and academician 1848. The following are some of his works exhibited in the Royal Academy: *King Joash Shooting the Arrow of Deliverance*, *Madonna and Child* (1846), *Meeting of Jacob and Rachel*, (1850), *Christabel* (1855), *The Good Shepherd* (1856), *Titian Preparing to make his Essay in Coloring*, *Neptune Assigning to Britannia the Empire of the Sea*, a study for a fresco at Osborne (1857), *St. John Leading Home his Adopted Mother*, *The Man of Sorrows* (1860), and *George Herbert at Bemerton* (1861).

DYCK, Sir ANTHONY VAN: see VANDYCK.

DYE, v. *dī* [AS. *deag*, a dye, a color: Dan, *dygge*, to sprinkle with water: Gael. *dath*, a hue, a color]: to color, to stain; to tinge deeply; to give a new color to: N. coloring matter; color; stain. DYEING, imp. *dī′ĭng:* N. the art or trade of fixing colors in various fabrics. DYED, pp. *dīd.* DY′ER, n. one who dyes. DYE-HOUSE, a building in which the operation of dyeing is carried on. DYER'S-MOSS, n. in *bot.*, *Roccella tinctoria;* also called Archil, Orchil, and Cudbear. DYER'S-SPIRIT, n. nitro-muriate of tin, employed as a mordant.

DYE—DYEING: art of imparting color to substances, chiefly textile fibres, so that it is not readily removed or

altered by such influences as the fibre may be subsequently subjected to. It differs from staining by its greater permanency and from painting because the color is not confined to the surface. The art of dyeing is very old; 'Tyrian purple' is supposed to have been discovered about 1500 B.C., it was formerly a badge of royalty. Formerly all dyes were of animal, vegetable, or mineral origin, at present the use of these is greatly restricted because, in many cases, far more brilliant, lasting and varied effects can be obtained by the use of artificial dyes, most of which were formerly derived from aniline, but which are now largely prepared from naphthalene, anthracene and many other more complex substances. Many thousands of such artificial dyes are known and new ones are being discovered daily. Some 'vegetable dyes' are now manufactured more cheaply than they can be grown, as for example madder (alazarin), and at present there is competition between natural and synthetic indigo. In general, animal matter such as wool, silk, feathers, fur, leather, etc., dye more easily than vegetable materials such as cotton or linen, and the colors of the former are more permanent (faster). The exact mode of applying the dye differs greatly, but the general principles on which dyeing is based will be indicated later. Dyes may be classed in various ways depending on the special character which it is desired to emphasize. Thus we may speak of alizarine, naphthalene, or diazo-dyes according to their origin or to their chemical nature, or they may be divided into acid and dasic dyes, which require different treatment to produce stable effects. Another important classification divides the dyes into *pigments*, such as magenta and indigo and *coloring principles*, such as alizarin. These terms have almost but not quite, the same meaning as *substantive* and *adjective* dye. The pigments dye if introduced into the fibres of the material and, consequently, their use is usually a very simple matter, each dye, however, can, at the best, yield only varying shades of one color. The coloring principles do not dye unless the material has been treated with some substance called a MORDANT (q.v.) which is capable of forming a stable pigment with the dye. Such stable pigments are termed 'lakes;' their color depends on the nature of the dye and also on that of the mordant, consequently it is possible, by varying the latter, to produce a number of entirely different colors from one and the same dye.

The question of whether dyeing consists of a chemical combination of the fibre with the dye, or whether it is held by the fibre merely mechanically or in a state resembling that of solution (solid solution), is at present unsettled. In some cases it is almost certain that there is chemical combination but, apparently, this is by no means always the case. Some dyes exert a delicate selective action on animal or plant tissues, for instance, one dye may color nerves and another muscle. It is on this fact that the staining (dyeing) of microscopic objectives is based, and it is to this method of work that we owe the great advances

made during recent years in our knowledge of the finer details of the most minute organisms such as the cell. Dyeing with pigment dyes usually consists in dissolving the dye in hot water, adding an acid, a base, or a salt, depending on the nature of the dye, and then dipping the fibre into the solution and allowing it to remain for a time. The brilliancy of the color is often greatly increased by subsequently soaping the fibres and washing them well with water. In the case of coloring principles the fibre is usually treated with a mordant and then with the dye, as above, but sometimes this order is reversed. Of course combinations of several dyes may be used, so as to increase largely the range of color and effect. Indigo and a few other substances are *reduced* to soluble compounds, which are generally colorless. The fabric is dipped into the solution and then exposed to air, the oxygen of which gradually regenerates the original dye from the reduced compound. Articles dyed directly with indigo readily part with the color, but if treated with the reduced substance termed 'indigo-white,' the blue color eventually obtained is very stable.

Patterns or figures may be obtained either by mixing the dye or mordant with some thickening material applying it to an engraved surface and then pressing this on the cloth, essentially as in the ordinary operation of printing with type on paper, or the whole cloth may be dyed and then have printed on it a substance having the power of discharging the color of the dye. In the former case there is obtained colored figures on a white ground, in the latter white patterns on a colored ground. In the case of fabrics consisting of two kinds of material, such as cotton and wool, it is often necessary to use two different dyes one for each material as there are few substances which will dye animal and vegetable products equally well. For an account of dyes see DYE-STUFFS. Dyeing by amateurs is best accomplished by the use of dyes in packets which are for sale at a low cost, full directions being given for the use of each individual substance.

DYER, *dī'ẽr*, ALEXANDER BRYDIE, U.S.A.: 1815, Jan. 10 —1874, May 20; b. Richmond, Va.: U. S. ordnance officer. He graduated at the U. S. Milit. Acad. 1837, served in the artil. branch of the army at Fortress Monroe and in the Seminole campaign in Fla., was transferred to the ordnance branch and on duty at various arsenals 1838–46; chief of ordnance of army invading Mexico 1846–48; brevetted 1st lieut. and capt. for gallant services in the Mexican war; and on ordnance and arsenal duty 1848–61. During 1859–63 he was a member of the ordnance board, and 1861–64 was in command of the armory at Springfield, Mass. He became chief of ordnance, U.S.A., with the rank of brig.gen., and was placed in charge of the ordnance bureau at Washington, 1864, and received the brevet of maj. gen. 1865 for distinguished services during the civil war.

DYER, *dī'ẽr*, GEORGE: 1755, Mar. 15–1841; b. London antiquary and scholar. He was educated first at Christ's Hospital, afterward at Emanuel College, Cambridge, which he entered 1774, and where, after four years' study, he took his degree B.A. During the next 14 years, he was variously engaged, chiefly at Cambridge, as usher, tutor, and as minister (of a Bapt. church), but he finally settled in London 1792. Here he applied himself to literature, and produced among many works of less note, *History of the University and Colleges of Cambridge* (Lond. 2 vols. 1814), and *Privileges of the University of Cambridge* (Lond. 2 vols. 1824). He also contributed largely to magazines. He died in London.

DY'ER, JOHN: 1900–58; b. Aberglasney, in Caermarthenshire, Wales: clergyman of the Church of England, and poet. He was educated at Westminster School, and was intended for the law, but abandoned that study for painting. In 1727, he published his poem, *Grongar Hill*, remarkable for simplicity, warmth of feeling, and exquisite descriptions of nature. He then made the tour of Italy, and returning in bad health, took orders, and obtained some ecclesiastical preferment. In his didactic poem, *The Fleece* (1754), the difficult subject is treated with great success; but the unpretending tone of the poem made no impression upon his contemporaries. Another poem, *The Ruins of Rome* (1740), abounds in isolated beauties. A collected edition of his poems appeared 1761.

DYER, LOUIS, American writer and lecturer: b. Chicago, 1851, Sept. 30. He was educated in early years in Chicago, Switzerland and France, was graduated from Harvard in 1874; and afterward studied at Balliol College, Oxford. He was assistant professor of Greek at Harvard (1881–87), and settled at Oxford in 1890, where he was lecturer at Balliol College (1893–96). He has lectured before the principal colleges of this country and published among other works *Studies of the Gods in Greece at Certain Sanctuaries Recently Excavated* (1891). *Oxford as it is*, (1902); *Machiavelli and the Modern State* (1904).

DYE-STUFFS: substances used in dyeing (q.v); some are derived from animals, vegetables, or minerals, but by far the larger number are prepared synthetically in various ways. The principal natural dyes at present in use are the following: *Indigo*, (q.v.) the most valuable blue dye known. It is used for either vegetable or animal fibres. The artificial indigo gives shades somewhat different from the natural product, because the latter is less pure i. e. contains a small quantity of dyes other than indigo. *Logwood* used for producing blacks dark blues, greys, and compound shades with cotton, silk, or wool. *Brazil-wood, peachwood, and lima wood* resemble logwood, but the colors are fugitive. They are used for the cheaper class of cotton goods. *Camwood, barwood and sanderswood* are chiefly employed for obtaining brown shades with wool. *Madder* is now little used, its place having been taken by alizarin,

its active principle, which is prepared artificially. *Cochineal*, chiefly used in wool dyeing, for the production of crimson and scarlet colors. It has been largely replaced by various azo colors in more recent years. *Lac-dye*, obtained from *gum-lac* (*shellac*) (q.v.), it is very little used. In general it resembles cochineal. *Archil* or *orchil*, also called, in the dry state, *cudbear*, is obtained from certain lichens. It is used to obtain compound colors such as browns, maroons, or olives on silk and wool. The colors are not fast to light. *Annatto* is occasionally used in silk dyeing to produce orange shades, which, however, fade easily. It is also employed to color butter, cream, oleomargarin and cheese, so as to make them appear 'richer.' Of course the color and 'richness,' whatever that may mean, have no necessary connection. *Safflower* was formerly used to obtain pink shades on cotton, and *weld* for producing yellow on silk and wool. *Old-fustic*, the wood of *Morus tinctoria* or *Maclura tinctoria*, found in Cuba, is the chief natural yellow coloring matter. It is chiefly used for dyeing wool, old gold, or olive shades. *Quercitron bark* is employed for cotton printing the results being similar to those with old fustic. *Flavin*, obtained from quercitron bark, gives bright orange or yellow on wool. *Young-fustic*, the wood of the Venetian sumach shrub, gives similar results to quercitron, but the colors are very fugitive. *Persian-berries*, the dried, unripe fruit of various species of *Rhamnus* found in Persia, gives yellow shades. It is chiefly used in cotton printing. *Turmeric*, also called Indian saffron, is the underground stem of *Amomum curcuma* and is largely cultivated in the east. It gives yellow shades which are fugitive, with cotton, silk, and wool and is sometimes used to color food such as pickles. *Catechu*, is extracted from various East Indian plants. It is employed to produce dark browns on silk and cotton. It must be remembered, in connection with the preceding list, that many hundreds of artificial dyes are known and new ones are being discovered daily. Any one of these may serve to displace one or more of the natural dye-stuffs mentioned above, either because of its greater cheapness, greater brilliancy, or greater fastness. The use of universal dyes is chiefly confined to cotton goods, which are soaked first in one solution then in another, thus *chrome yellow* (lead chromate) is obtained from a soluble lead salt and sodium bichromate; *iron buff* (ferric hydroxide) from a ferric salt and sodium carbonate; *manganese brown* (manganic hydroxide) from a manganous salt, and sodium hydroxide (caustic soda), followed by bleaching powder; *prussian blue*, from cotton dyed iron-buff by treating it with potassium ferrocyanide solution.

Artificial Coloring Matters.—For the reasons mentioned above, it is impossible to give anything like a complete list of artificial dyes. Apart from the fact that it could not be complete, it would have no value to any one but an expert and would simply consist of a list of trade names, almost all of which indicate nothing concerning the nature

or composition of the dye to anybody outside the particular factory where the substance in question was first discovered. The chemical constitution of relatively few of these dyes is known, and, of course, many of them are no longer manufactured because new ones have been prepared which offer advantages in stability, cost, or ease of application. A few only of the more important groups of these dyes will be mentioned briefly. *Nitro compound.* Including picric acid (q.v.), used to dye animal fibres yellow. *Azo-dyes*, an enormous number are known. Those derived from benzidine being specially important. The *tetra-azo* dyes are allied to the foregoing ones. *Triphenyluuthane colors* include the most important basic colors, which were the first artificial dyes to be discovered; among them are magenta, rosaniline blue, Hofmann's violet, denzaldhyde, etc. Many of these are no longer used because of their fugitive color. *Phthalein dyes*, these are related to phenol-phthalein and are among the most brilliant known, but they are also very fugitive. *Anthracene dyes* constitute one of the most important classes with which we are acquainted. They give very fast colors of varied shades, depending on the mordant.

The dyes of the *quinoline*, *acridine*, *eurhodine*, *indamine*, *saffranine* and *induline* series are very numerous, and some are of considerable value. Chemically they are quite complex, both from the point of view of manufacture and also of chemical constitution. Very marked differences in the shade of a color may be obtained by allowing a fabric to take up more or less of a dye; the color may be modified or entirely changed by the use of various mordants with one given dye; the important color may sometimes be varied according to the mode of application to the fabric including the acid, base, or salt added to the dye solution, and, finally, mixtures of dyes are largely employed to produce a desired effect, in a similar manner to the use, by an artist, of a few colors on his palette, although his picture may exhibit very numerous and delicate gradations of color and shade. Indeed the skillful dyer prides himself on his ability to obtain the maximum number of different effects with the minimum number of dyes. In view of these facts, it is not a matter for surprise that we should have at our disposal the enormous array of colors to which of late years we have become accustomed. Of course, in the foregoing, no account has been taken of the colored patterns and combinations obtained by weaving threads of different tint. See DYEING.

DYING, a. *dī'ĭng* [from DIE, which see]: perishing; losing life; wasting away; mortal; given or uttered just before death; pertaining to death. DY'INGLY, ad. *-lĭ.*

DY'ING DECLARA'TION: declaration by a person in the immediate prospect of death, relative to the mode of his death. By the law of all nations it is received as evidence. The ground of this exception to the general rule of law, that hearsay evidence is inadmissible, is thus clearly stated by Lord Chief Baron Eyre: 'That they are declara-

tions made in extremity, when the party is at the point of death, and when every hope of this world is gone; when every motive to falsehood is silenced, and the mind is induced, by the most powerful considerations, to speak the truth: a situation so solemn and so awful is considered by the law as creating an obligation equal to that which is imposed by a positive oath in a court of justice.' In Scotland, the dying declaration of a witness is admissible even though he is not himself conscious of the danger of death. In this respect, the law of Scotland differs from that of England and America. The general rules as to dying declarations are, that they cannot be received in any civil case, and in criminal cases only where the death of the deceased is the subject of the charge, and the circumstances of the death are the subject of the dying declaration. They must be made, except in Scotland, with the full knowledge of impending death; they are subject to the ordinary rules of law as to capacity to give evidence; they must relate to facts only, and not opinions, and must be freely made; they must be complete in themselves, and if it appear that the dying man intended to qualify them, they cannot be received. See Taylor on *Evidence.*

DYKE, n. *dīk:* see DIKE.

DYKE-REEVE, or DYKE-REVE, n.: in *law,* an officer who has charge of the dikes and drains in fenny countries.

DYMOND, *dī'mond,* JONATHAN: 1796–1828, May 6; b. Exeter, England: son of a linen draper, and followed the same trade. He was a member of the Soc. of Friends, and noted as a moralist, and wrote two works which are highly esteemed and have often been reprinted: *Inquiry into the Accordances of War with the Principles of Christianity* (1823), and *Essays on the Principles of Morality, and on the Private and Political Rights and Obligations of Mankind* (published after his death, 1829).

DYNACTINOMETER, n. *dī-năk-tĭ-nŏm'ĕ-tĕr* [Gr. *dunamis,* power; *aktinos,* a ray or beam, and *metron,* a measure]: in *optics,* an instrument for measuring the intensity of the photogenic rays of light, and computing the power of object glasses.

DYNAM, n. *dī'năm* [Gr. *dunamis,* power]: in *Eng.,* a term used to express a unit of work equal to a weight of one pound raised through one foot of space in one second; a foot pound.

DYNAMICS, n. plu. *dĭ-năm'ĭks* [Gr. *dunamĭkos,* powerful—from *dŭnămis,* power]: the science that treats of the laws regulating the force or power of moving bodies. DYNAM'ICAL, a. *-ĭ-kăl,* pertaining to dynamics; also DYNAM'IC, a. *-ĭk.* DYNAM'ICALLY, ad. *-lĭ.* DYNAMIC UNITS, units for measuring forces and their effects. The *unit of force* is that force which will impart a unit of velocity to a unit of mass; the English and American unit of force is one lb. avoirdupois; and the corresponding unit of mass is one lb. divided by 32.16. The *unit of work* is the force which will raise a unit of weight through a

unit of space; the two items are indicated in the term *foot-pound.* The horse-power is a merely conventional and arbitrary unit which equals (American) 33,000 foot-pounds per minute (see HORSE POWER). DYN'AMOM'ETER, n. *-mŏm'-ĕ-tĕr* [Gr. *metron*, a measure]: instrument for measuring the relative strength of men and animals, etc. DYNAMITE, n. *dī'na-mīt* or *dĭn'ă-*, powerful explosive agent, consisting of porous silica, saturated with nitro-glycerine (see NITRO-GLYCERINE: EXPLOSIVES). DYNAM'ETER, n. *-ĕ-tĕr* [Gr. *metron*, a measure]: instrument for ascertaining the magnifying power of telescopes; the magnifying power is found by measuring the diameter of the image formed at the solar focus and seen through the eye-piece. DYNAMISM, n. *dī'-nam-ĭzm*, the doctrine of Leibnitz, that all substance involves force. DYNAMET'RICAL, a. *dĭn'a-mĕt'rĭ-kăl*, pertaining to a dynameter. DYNAMIC-ABSORPTION, n. in *nat. philos.*, the absorption of heat when dynamic chilling takes place. DYNAMICAL ELECTRICITY, n. current electricity. DYNAMIC CHILLING, n. in *nat. philos.*, the chill or cold produced when a tube full of gas or vapor is rapidly exhausted; the missing heat has gone to produce motion. DYNAMIC ENERGY, n. in *nat. philos.*, the force contained in a moving body. DYNAMIC HEATING, n. in *nat. philos.*, the heat imparted to the particles of a gas when the latter is entering an exhausted tube. It is produced by the collision of the particles against the sides of the vessel. DYNAMIC-RADIATION, n. in *nat. philos.*, the radiation of heat when the dynamic heating of gas takes place. DYNAMIC-THEORY, n. theory now largely accepted which represents a heated body as being simply a body the particles of which are in a state of vibration. This vibratory movement is supposed to increase as the body is still more heated and to diminish proportionately as it cools. It is called also the mechanical theory of heat. See HEAT: THERMO-DYNAMICS.

DYNAM'ICS: division of mechanics (q.v.) which contains the doctrine of the motion of bodies produced by forces. It is essentially a science of deduction from the laws of motion (see MOTION, LAWS OF), under which head see also a sketch of the growth of the science. For various branches of dynamics, see the separate titles. The following is a view of the main branches and their correlation.

I. The first branch of dynamics deals with the fundamental conceptions of the science, their names and definitions, such as velocity (q.v.) and the different kinds of motion (q.v.), and accelerated motion (q.v.); force, accelerating force, and moving force (see FORCE). Under this branch also falls the composition of motions (see COMPOSITION OF FORCES AND MOTIONS). II. The second main branch of dynamics treats of the motion, free or constrained, of points. Here two problems are solved in each case—i. e., whether the motion be free or constrained—viz., a direct and an inverse problem; as for example: 1. To determine the path of a point when the forces are given which act upon it; 2. To determine the forces or force acting on a point when its path is given. This division of dynamical

problems into direct and inverse, obtains in all the branches. It may be mentioned that it was by solving the inverse problem that Newton and Huygens effected their greatest glories in connection with dynamics. The method of treating the case of a free point now generally employed, is due to Euler. See, under this head, CENTRAL FORCES: FALLING BODIES: PROJECTILES. III The third main branch of dynamics is concerned with the motion of a rigid system of points, or of a solid body. Few of the sub-branches of this part of dynamics are capable of exposition in this work, but see CENTRE OF GYRATION: CENTRE OF OSCILLATION: CENTRE OF PERCUSSION: PENDULUM. The honor belongs to D'Alembert of establishing a general method of treating problems in rigid dynamics. Previous to his time, each set of such problems was treated on some principle applicable peculiarly to itself. D'Alembert invented one (which bears his name) applicable to all such problems: for its statement, see RIGID DYNAMICS. IV. The fourth main branch of dynamics is concerned with motions of rotation. A system of rigid points may be subject to two independent kinds of motion. It may suffer a motion of *translation* in space, or a motion of *rotation*, about some point or axis within itself, or it may suffer at once a motion of translation and a rotatory motion. These may be treated conjunctly or independently; they are now uniformly treated independently by investigating, 1. The velocity and direction of the centre of gravity of the system; and 2. The direction at each instant of the spontaneous axis of rotation passing through the centre of gravity (see ROTATION), and the velocity of the rotation of the system round that axis. To effect the second task, Poinsot proposed his theory of couples (q.v.). For the conservation of living forces (*virium vivarum*), and the principle of least action, see FORCES: see also MOMENT. Dynamics is used by some recent writers with a wider signification, as denoting the science which investigates the action of Force (1) in compelling rest or preventing change of motion, and (2) in producing or changing motion; the former branch being called *Statics*, and the latter *Kinetics*.—See STATICS: KINETICS: THERMO-DYNAMICS.

DYNAMITE: see EXPLOSIVES: NITRO-GLYCERINE.

DYNAMITE GUN, PNEUMATIC: see PNEUMATIC DYNAMITE GUN.

DYNAMO-GENESIS, in psychology: A term used to indicate the fact that organic activities, whether mental or physical, are inherently active. James emphasises our recognition of the fact in the thought that consciousness is motor, and Baldwin by pointing out that conscious states in being conscious are also impulsive. The fact has received ever increasing recognition through the development of recent biological, physiological and psychological researches in all their phases and is now a foundation principle of psychological theory. For example, will is now regarded as an organic function and not as an

emergence through volition of an extra-organic entity, the soul.

DYNAMO, any machine for the generation of electric current. See ELECTRICAL MACHINES.

DYNAMOGRAPH: see DYNAMOMETER.

DYNAMOM'ETER: an instrument used in measuring the force of muscular exertion. It is called dynamometer when the record is direct and numerical, not graphic. When the record is graphic the instrument is called dynamograph. See ERGOGRAPH. It is usually made to measure the grip of the hand or the pull or push of the hand, the fingers, or the feet, and commonly works on the principle of the spring scale. In psychology it is used, e. g., to measure the effect of pleasant or unpleasant stimuli upon muscular power, the effect of suggestion and kindred influences, the relation of strength to various mental capacities, the effect of fatigue, training, etc.

DYNASTES, n. *dī-năs'tēz* [Gr. *dunastēs*, a master or ruler] in *entom.*, a genus of coleoptera, the typical one of the family *Dynastidæ*. They are the largest beetles of the order, and come from India, S. America, etc., but none from Great Britain. DYNAS'TIDÆ, *-tĭ-dē*, family of lamellicorn coleopterous insects. They are remarkably powerful, and may be regarded as the giants of the coleoptera. They burrow in the earth and in putrescent timber, on which they chiefly feed. They are natives mostly of tropical countries. They include the Atlas-beetle, the Elephant-beetle, the Hercules-beetle, etc.

DYNASTY, n. *dĭ'nas-tĭ* or *dĭn'ăs-tĭ* [Gr. *dunastei'a*, lordship—from *dunas'tes*, a lord or chief. F. *dynastie*]: a race or succession of kings of the same family or line. DYNASTIC, a *dī-năs'tĭk*, relating to a dynasty, also DYNAS'TICAL, a. *-tĭ-kăl*.

DYNE, n. *dīn* [Gr. *dunamis*, power]: in *phys.*, a unit of force; the force which, acting upon a gramme for a second, generates a velocity of a centimetre per second. It is defined as the force that must be exerted upon a gram of matter for one second, in order to give it a velocity of one centimetre per second. The attractive force that the earth exerts upon a milligram of matter is somewhat different in different latitudes, but it may be said, for the sake of illustrating the order of magnitude of the dyne, to be about 1,02 dynes. For many purposes this is too small a unit for convenience, and a larger unit, called a 'megadyne' and defined as equal to 1,000,000 dynes, is often used in its place. To the same degree of approximation as before, the attraction that the earth exerts upon a kilogram of matter may be said to be equal to 1.02 megadynes. See UNITS.

DY'NOGRAPH, an apparatus used in modern railroading for testing the inequalities in the road-bed or track. It consists of a recording instrument mounted in a car and geared to the wheels thereof. An automatic pencil

records the slightest roughness or inequalities, and locates them. The dynograph is in use on all the great railroads.

DYOXYLITE, n. *dī-ŏks'ĭ-līt* [Gr. *duo*, two, *oxus*, sharp, *lithos*, stone]: same as LANARKITE.

DYRRACHIUM: see DURAZZO.

DYS, *dĭs* [Gr. *dus*]: a Gr. prefix only used in composition, and indicating difficulty, badness, evil, as opposed to Gr. EU, signifying goodness.

DYSÆSTHESIA, n. *dĭs'ēz-thēz'ĭ-ă* [Gr. *dus*, badly; *aisthanŏmai*, I feel]: in *path.*, impaired power of feeling.

DYSART, *dī'zart:* royal, parliamentary, and municipal burgh and seaport in the south of Fifeshire, Scotland, on the rocky shore of the Firth of Forth, 12 m. n.n.e. of Edinburgh. It chiefly consists of three streets, with a small square. In the High Street are many antique houses, with inscriptions and dates. It has ship-building, flax-spinning, and manufactures of damasks and ticks. In the vicinity are coal and ironstone mines. Pop. (1901) 3,539.

DYSASTER, n. *dĭs-ăs'tĕr* [Gr. *dus*, *bad*, ill; *astēr*, a star]: in *paleon.*, genus of irregular echinoids, the type of the family *Dysasteridæ*.

DYSASTERIDÆ, n. *dĭs-as-tĕr'ĭdē* [mod. L. *dysaster*]: in *paleon.*, family of irregular echinoids, found in the Oolite and Chalk; called also *Collyritidæ*.

DYSCHROA, n. *dĭs'krŏ-a* [Gr. *dus*, ill; *chroia*, color]: in *med.*, a discoloration or discolored state of the skin.

DYSCRASIA, n. *dĭs-krā'zĭ-ă* [Gr. *duscrāsia*, a bad mixture—from *dus*, an inseparable particle, denoting 'with pain, with difficulty, badly'; *krasis*, a mixture]: a pathological term much used in Germany by certain authorities, to indicate an altered condition of the blood and fluids of the system, leading to constitutional diseases, as dropsy, cancer, delirium tremens, lead poisoning, etc. See CACHEXIA and DIATHESIS.

DYSENTERY, n. *dĭs'ĕn-tĕr-ĭ* [Gr. *dusĕntĕr'ĭă*, a flux—from *dus*, badly; *entera*, the bowels]: a flux or looseness of the bowels, accompanied with a discharge of blood and mucus, and griping pains. DYS'ENTER'IC, a. *-ĭk*, pertaining to or proceeding from dysentery.—*Dysentery* differs symptomatically from diarrhœa (q.v.) chiefly in being attended by marked fever and pain, as also by the presence of blood and inflammatory products in the discharges. Dysentery is, in fact, a disease of the mucous membrane of the colon (q.v.) or great intestine, and when severe, it is followed by destructive ulceration of that mucous membrane to a great extent, the intestine becoming much contracted at intervals, especially in its lower part, and the evacuations being therefore apt to be retained, especially the solid portions. The most distinctive symptoms are excessive pain in evacuating the bowels, and frequent ineffectual attempts at evacuation (*tenesmus*), tenderness on pressure in the left side of the abdomen, discharges of blood mixed with mucus, and comparatively little fecal

matter; these symptoms being accompanied or followed by intense fever, passing into early depression of strength. Although the symptoms are in general alike, there are at least two, and probably more diseases included in the term dysentery; one of these is caused by the presence of an animal microparasite, an ameba, the other of a vegetal micro-organism, a bacillus, in the large intestine. The amebic form is due to the presence of *Amœba dysenteriæ*, a single-celled animal organism resembling a white blood corpuscle; the bacillary form is due to the presence of *Bacillus dysenteriæ* in the colon. This same organism or one very similar has been found in this country in cases of infantile summer diarrhea which would thus appear to be a form of dysentery rather than of simple diarrhea. Chronic dysentery is almost always of the amebic form. Dysentery is essentially a tropical disease but occurs in the warm season in northern latitudes in both Europe and America. It is spread through the medium of the fecal discharges which contaminate the water supply. It is most important, therefore, that the stools should be thoroughly disinfected by crude carbolic acid, lime, or corrosive sublimate.

The treatment of dysentery should always be entrusted to a physician, as even in apparently mild cases, the danger is considerable. The best domestic plan, when medical advice cannot be at once procured, is to give a moderate dose of castor oil, guarded by 20 or 30 drops of laudanum, and then either Dover's powder in ten-grain doses every hour or two, or ipecacuanha wine in two or three successive teaspoonful doses at similar intervals, each with 10 or 20 drops of laudanum, according to the effect on the system. If vomiting is repeatedly produced, the dose of ipecacuanha wine should be lessened. If the pain and irritation of the bowels are extreme, the opium had better be given by a small injection with starch, after the lower bowel has been well cleansed by a larger warm-water injection; and it will be well to repeat the simple warm-water injection at intervals throughout the treatment. Some authorities recommend a saline laxative, such as Rochelle salts, at the beginning, instead of castor oil. Cleanliness and pure fresh air are indispensable. Mustard-plasters on the abdomen, acting as counter-irritants, have been found very helpful. The diet may be of eggs, raw or nearly raw mixed with sherry wine, also toast and weak tea. Rice-water may be used as a beverage together with beef-tea. Abscess of the liver is a frequent sequel of so-called tropical dysentery, or chronic amebic dysentery.

DYSGENESIS, n. *dĭs-jĕn′ĕ-sĭs* [Gr. *dus*, with difficulty, and *genesis*, generation]: the condition of not breeding freely; infecundity; sterility.

DYSLYSIN, or Dislysine, n. *dĭs′lĭ-sĭn* [Gr. *dus*, difficult; *lusis*, solution]: in *chem.*, a neutrally resinous substance, $C_{24}H_{36}O_4$, so named from its insolubility in water, = cholic acid minus two molecules of water; an ingredient

of *bilin* remaining undissolved after its solution and digestion; an organic substance soluble with difficulty in naphtha; turpentine, etc.

DYSODILE, n. *dĭs'ŏ-dīl* [Gr. *dusōdēs*, fetid; *ilus*, mud]: yellow or grayish laminated bituminous shale or Tertiary mud, found often with lignite; evidently of animal origin, burning vividly and emitting a highly fetid odor.

DYSOPSY, n. *dĭs-ŏp'sĭ* [Gr. *dus*, bad, ill; *opsis*, the sight]: in *med.*, dimness or weakness of sight.

DYSPEPSIA, n. *dĭs-pĕp'sĭ-ă* [Gr. *duspĕpsĭa*, difficulty of digestion—from *dus*, badly; *pepto*, I digest]: bad digestion; difficulty of digestion; also DYSPEP'SY, n. *-sĭ*. DYSPEP'TIC, a. *-tĭk*, afflicted with dyspepsia: N. a person afflicted with bad digestion: see INDIGESTION.

DYSPHAGIA, n. *dĭs-fā'jĭ-ă* [Gr. *dus*, badly; *phagein*, to eat]: in *med.*, difficulty of swallowing.

DYSPHONIA, *dĭs-fō'nĭ-a* [Gr. *dus*, difficult; *phōnē*, sound of the voice]: difficulty of voice or of vocalization; a disease arising from various causes, and having a variety of forms, but most commonly some form of sore throat, with huskiness, coughing, and expectoration. See APHONIA: LARYNX: THROAT, AFFECTIONS OF THE: VOICE.

DYSPHORIA, n. *dĭs-fōr'ĭ-a* [Gr. *dus*, hard, bad, etc.; *phoros*, bearing, carrying]: in *med.*, morbid restlessness, producing wakefulness at night; the disease or morbid symptoms colloquially termed the fidgets.

DYSPNŒA, n. *dĭsp-nē'a* [Gr. *duspnoi'a;* L. *dyspnœă*, difficulty of breathing—from Gr. *dus*, badly; *pnĕō*, I breathe]: a difficulty of breathing: see ASTHMA: RESPIRATION, ORGANS AND PROCESS OF.

DYSTOME, a. *dĭs'tŏm* [Gr. *dus*, bad, ill; *tomē*, a cutting]: in *min.*, having an imperfect fracture or cleavage.

DYSURIA, n. *dĭs-ū'rĭ-ă* [Gr. *dus*, badly; *ourĕō*, I pass urine: *ouron*, urine]: difficulty in urination. DYSU'RIC, a. *-rĭk*, pertaining to.—The causes of Dysuria are various: see BLADDER: URINE: URETHRA.

DYTISCUS, *dī-tĭs'kŭs* [Gr. *dytes*, a diver]: Linnæan genus of aquatic coleopterous insects or water-beetles, now forming the tribe or family *Dytiscidæ*. They are *pentamerous* coleoptera; that is, have all the *tarsi* five-jointed. Their general form is oval, the outline little broken and the surface very smooth. The respiratory organs of the perfect insect are not adapted to the extraction of air from water, and it must occasionally come to the surface to breathe, where is rests for a short time back downward, and with the extremity of the abdomen exposed to the air, the openings of the air-tubes being in the last segment. The *Dytiscidæ* are excessively voracious, feeding upon any kind of animal food, and boldly attacking creatures larger than themselves. They are very amusing inmates of the fresh-water aquarium, and sometimes live in it for a year or two, getting tame, and readily coming to be fed with small earthworms, bits of beef, etc. The species are numerous, and vary

much in size, some being very small, and some almost two inches in length. A very common British species is *Dytiscus marginalis*, about an inch and a quarter in length, of a dark olive color, the thorax and outer sides of the elytra margined with yellow. All the species are found in lakes, ditches, marshes, and the still parts of rivers. They often leave the water by night, and can fly well. Their larvæ have the body long and tapering, composed of eleven rings or segments, besides the head. They hide themselves in the earth, in chambers which they make for themselves, before changing into pupæ.

DYVEKE, *dü′vė-kā* (i.e., *dove*): called by the Latin chroniclers Columdula: mistress of Christian II. of Denmark; 1488–1516; b. Amsterdam: often celebrated in works of poetry and fiction. Christian became acquainted with her in 1507 in Bergen, where her mother, Sigbrit Wylms, had settled as an innkeeper. She followed him to Opslow, and, when he had mounted the throne, to Copenhagen. Notwithstanding the marriage of Christian with Isabella, sister of the Emperor Charles V., his relation with Dyveke was continued, and her mother acquired unbounded influence in the affairs of the country. Though Dyveke herself never interfered,she was naturally hated by the nobles; and her sudden death, 1516, was doubtless by poison. The king in vengeance put to death the gov. of the palace, Torben Oxe, who was believed to have sought Dyveke's favor, also the treasurer Faaburgh. The sad story has been the subject of novels and tragedies; e.g., *Dyveke*, by Samsöe, Danish poet; *Wilhelm Zabern*, by J. C. Hauch, a Dane; and Riekhoff's tragedy, *Düveke* (Berl. 1843).

DYVOUR, *dī′vûr*, AND DYVOUR'S HABIT [from the Fr. *devoir.*, to owe; a debtor]: terms in the old legal language of Scotland. A dyvour was a bankrupt who, under various acts 1606–96, was compelled to wear a conspicuous and hideous costume. It was ordained 1606 that a pillory be erected near the Market Cross of Edinburgh, with a seat upon which dyvours shall be exposed once on a market-day, wearing a yellow hat or bonnet. Later acts prescribed a fuller costume to be worn continuously in public. This barbarism had fallen into disuse long before it was abolished by law 1836.

DZE′REN: see ANTELOPE.

DZIGGETHAI, *zĭg′gė-tā*, or DJIGGETAI, *jĭg′gė-tā*, or KIANG, *kī′ang*, or KHUR, *kûr*, or GOOR, *gôr* (*Equus Hemionus*): quadruped nearly allied to the ass, but horse-like; probably the *hemionus* (half-ass) of Herodotus and Pliny. See Ass. It inhabits the elevated steppes of Tartary, extending into s. Siberia and to the borders of India. In size, in gracefulness, and in neighing it resembles a horse, though its general shape is much like that of a mule. The Dziggethai lives in small herds, sometimes of several males and several females, sometimes of a single male with about 20 females and foals. It is very fleet, and shy or watchful,

and has great powers of endurance. The Mongols and Tungûs hunt it eagerly for its flesh. It has been partly domesticated, but is not known to breed in that state.

DZUNGARIA, *zông-gâ′rĭ-â*, or SOONGARIA, *sông-gâ′rĭ-â:* country of central Asia, forming part of the Chinese empire; bounded n. and w. by Russia, e. by the Chinese province of Kansu, s. by East Turkestan. It is an elevated and almost desert plateau between the Altai and Thian-Shan Mountains, and is intersected by subordinate ranges. Between the mountains are several fertile valleys, watered by numerous lakes, and cultivated by nomadic trides. Millet and barley are the chief agricultural products; gold, silver, and iron are found in considerable quantities; and salt abounds in the lakes and mines. The country was originally inhabited by the Oo-Sun, distinguished from neighboring nations by their blue eyes and red beards. They were expelled by the Turks in the 6th c., and became subject to the Mongols. In 1754 the country was conquered by China, and has since been administered as a province of that empire, though a portion is claimed also by Russia. Pop. (est.) 600,000.

E

E, or e, *ē:* fifth letter in the Græco-Roman alphabets, second of the English vowels. Its original and fundamental sound is that heard in Eng. *tent.* The sound heard in *me* is not given to it in any language but English. In the series of vowels it stands intermediate between *i* and *a.* For the various vowel-sounds represented by the character *e* in English; see LETTERS AND ARTICULATE SOUNDS.

E is used in *numerals* for 250; in *chem.*, for the element Erbium; in *chh. calendars,* E. is the 5th Dominical letter.

E: a prefix, meaning, 'out of; from': see EX.

E, in Music: the third note or sound of the natural diatonic scale, and a third above the tonic C, to which it stands in proportion as 5 to 4. As a major third, that is, when the tonic C vibrates 4 times, the E above vibrates 5 times. E is the third harmonic which arises naturally from C as a fundamental note. E major, as a key, has 4 sharps at its signature, viz., F, C, G, and D sharp. E minor, as a key, has only one sharp, F, same as G major, of which E is the relative minor. E is used for the note Hypate in Greek music; the key-note of the church mode, called Phrygian; the note Elami in the system of Hexachords.

EACH, a. *ēch* [AS. *ælc;* Low Ger. *elk;* Scot. *ilk,* each—from AS. *æ* or *á,* ever; *lic,* like]: one of two; every one of any number considered separately. The correspondent word to *each* is *other;* the two words are used elliptically.

EADIE, *ē'dē,* JOHN, D.D., LL.D.: 1810–76; b. Stirlingshire, Scotland. He was educated at Glasgow University. As pastor of the Secession Church in Glasgow, he took part in the union which constituted the United Presbyterian Church (q.v.), and soon became known for his works on Biblical criticism and interpretation. Among these are a *Biblical Cyclopædia,* and an *Analytical Concordance;* also a work on *Early Oriental History;* a *Life of Dr. Kitto;* and a *History of the English Bible.*

EADMER, *ĕd'mėr,* OF CANTERBURY: lived in the beginning of the 12th c.; died probably 1124, Jan. He seems, from his name, to have been the child of English parents. At an early age he entered the Benedictine monastery at Canterbury; and when St. Anselm, 1093, was made archbishop of that see, Eadmer became one of his most devoted friends, sharing his exile, watching his deathbed, ordering his burial, and writing the chronicle of his life. Eadmer continued at Canterbury, in high esteem with St. Anselm's successor, Apb. Ralph, until 1120, when, at the request of King Alexander I. he went to Scotland, and

was there chosen bp. of St. Andrews. The question of lay investiture of ecclesiastical benefices was then in its crisis; there was a controversy between Canterbury and York for jurisdiction over the see of St. Andrews; that see, again, asserted its independence of either of the English metropolitans; and E. seems to have added to all these perplexities a difficulty as to his monastic allegiance. 'Not for all Scotland,' he said to the Scottish king, 'will I renounce being a monk of Canterbury.' The king, on his side, was equally unyielding; and the issue was the return of E. to his English monastery, unconsecrated, indeed, but still claiming to be bishop of St. Andrews. He was made precentor of Canterbury. He tells us that, from his childhood, he was a diligent observer of contemporary events, especially in church affairs; and this habit has given more than usual interest to his writings. The most valuable are *Historia Novorum*, or History of his Own Times, printed first by Selden 1623, and his *Vita Anselmi*, or Life of St. Anselm, published first at Antwerp 1551. Both these works are included in the selection of his writings published by the Benedictines of St. Maur (as a supplement to their edition of the works of St. Anselm), in 1 vol. fol. (Paris 1721). His lives of St. Odo, St. Dunstan, and St. Bregwyn, of Canterbury, and of St. Wilfrid and St. Oswald, of York, were printed, some of them, by Wharton, in the second part of his *Anglia Sacra* (Lond. 1691), and others by Gerberon in his *Anselmi Opera* (Paris 1675). The history of E., in relation to the bishopric of St. Andrews, is given at considerable length by Lord Hailes, in his *Annals of Scotland*, 1. pp. 59–71; and, still better, in Mr. Grub's *Ecclesiastical History of Scotland*, I., pp. 209–217 (Edin. 1861).

EADS, *ēdz*, James Buchanan, ll.d. 1820, May 23—1887, Mar. 8; b. Lawrenceburg, Ind.: engineer. He removed with his parents to St. Louis, Mo., 1833, became a clerk on a Mississippi river steamboat 1839, invented a diving-bell boat, and with it engaged in recovering property and raising steamboats sunk in the Mississippi and its tributaries 1842, and established the first glass works w. of the Ohio at St. Louis, 1845. In 1861, after several conferences with Pres. Lincoln and his cabinet, he formed a plan to defend the western rivers, and soon afterward built 8 iron-clad steamers in 100 days; following these, 1862, with a number of iron clad gun and mortar boats, which took part in numerous important engagements and in the capture of Mobile. During 1867–74 he was employed in building the great steel bridge across the Mississippi at St. Louis, having at the time the longest arches and deepest foundations of any similar structure in the world. In 1874 he made a proposition to congress to deepen and improve the channel at the mouth of the Mississippi river by means of jetties at a cost of $5,250,000, guaranteeing to secure and maintain a channel of from 8 to 30 ft. depth. His plans were strongly opposed by U. S. engineers, but congress passed a bill authorizing him to attempt the improvement of the s.w. pass bar. He began the work 1875, June, secured

a depth of from 8 to 13 ft. in 9 months, of 30 ft. by 1879, July, and a minimum depth of 34 ft. by 1884, July 1. (For his plan see DIKE.) In 1887 congress passed a bill to enable him to construct a ship-railroad across the isthmus of Tehuantepec, a few weeks before his death. He received the degree LL.D. from the Univ. of Mo. 1874, and the Albert medal of the Royal Soc. of Arts 1884.

EAGER, a. *ē'gėr* [F. *aigre* and *eigre*, sharp, biting—from L. *acrem*, severe, sharp: It. *agro*, sour, severe: comp. Gael. *eigreadh*, cold]: acid or sour; severe; keen; ardently desirous; vehement; impetuous; earnest. EA'GERLY, ad. *-li*. EA'GERNESS, n. earnestness; ardor of inclination.—SYN. of 'eager': ardent; forward; zealous: fervent; hot; sharp; keen;—of 'eagerness': ardor; vehemence; heartiness; impetuosity; avidity; greediness.

EAGLE, n. *ē'gl* [F. *aigle*—from It. and L. *aquila*, an eagle—from L. *aquilus*, dark-colored, dun]: a large bird of prey; in the *United States*, a gold coin equal to 10 dollars (see DOLLAR); in *heraldry*, emblem of might and courage; variously represented, but usually 'displayed' (q. v.). EAGLE EYED, sharp-sighted. EAGLET, n, *ē'glĕt*, a young eagle. EAGLE-RAYS, n. in *zool.*, name of the fishes belonging to the genus *Myliobatis*. EAGLE-STONE, a variety of iron ore having a concentric structure, fabled to have been hatched in the nest of the eagle. EAGLE-WOOD, a fragrant wood from tropical Asia, also called aloes-wood (q.v), the *Aquilāriă ovātă*, and *A. agăllōcha*, ord. *Aquilāriāceæ*.

EA'GLE (*Aquila*): genus of birds of prey, by some naturalists subdivided into several genera, constituting a group which contains the largest and most powerful of the *Falconidæ*. From the most ancient times, the E. has been universally regarded as the emblem of might and courage; and, like the lion, it has been fancifully invested with other attributes of greatness, such as men thought to harmonize with these. Its extraordinary powers of vision, the vast height to which it soars in the sky, the wild grandeur of the scenery amid which it loves to make its abode, and perhaps also its longevity, have concurred to recommend it to poetic regard. It was associated with Jupiter in the Roman mythology; its figure on the standards of the Roman legions expressed and animated their confidence of victory: see EAGLE (as a milit. standard).

The eagles have the beak not curved from the very base, like the true falcons, nor notched on the edge; neither are their wings so long in proportion to their size. Their wings are, however, very broad and expansive; their legs are very robust; their claws curved, sharp, and strong. In the most restricted use of the generic term, the true eagles, of which the Golden E. may be taken as type, have a rather short bill, curved from the cere, with a slight festoon on the edge of the upper mandible; the tarsi are short, and feathered down to the toes. This last character distinguishes them at once from the ernes (q.v.), often also called eagles. There are several species of true eagles well ascertained, though in this as in allied genera much confusion has

arisen from the diversity of plumage at different ages.—The GOLDEN E. (*A. chrysaëtos*)—of which what is called the Ring-tailed E. is the young—is about three ft. or three ft. and a half in length, and eight ft. in spread of wing. The female is rather larger than the male; the color is dark brown, in some parts almost black, the head and back of the neck in mature birds covered with pointed feathers of a golden-red color; young birds have a considerable part of the tail white. The Golden E. is the largest of European eagles, and is found not only throughout Europe, preferring wild and mountainous situations, but through almost the whole northern hemisphere; it is among the birds of India, of the north of Africa, and of N. America; and the savage warrior of the Rocky Mountains, 'as well as the Highland chieftain, glories in his eagle plume.' Although occasionally seen in all parts of Britain, it builds its nest only in mountainous districts, carrying a few sticks and brambles to the inaccessible shelf of a rocky precipice, where the eggs are deposited almost on the bare rock. The Golden E. is now rare even in the Highlands of Scotland. A great quantity of prey is necessary to support a pair of these birds and their two or three young ones: and not only hares, game of every kind, and lambs are carried to the eyrie, but larger animals are sometimes attacked, and almost every district where eagles build their nests has its story of children carried off to feed the eaglets, and often of their almost miraculous preservation.—The next in size to the Golden E. among the eagles of Europe, is the Imperial or Grecian E. (*A. imperialis*), but it is more common in Egypt than in Europe, and has never been seen in Britain.—The Spotted E. (*A. nævia*) has been found in the south of Ireland.—There is an Australian E. (*A. fucosus*).

Eagles were ranked among what were called, in the language of falconry, ignoble birds of prey, as incapable of being tamed and employed to assist in the sports of man. But either the Golden E. or the Imperial E. is used by the Tartars in the chase of antelopes, wolves, foxes, hares, etc.

The white-tailed E. or Cinereous E. of Britain is the common erne (q.v.). The White-headed E. or bald-headed E. of America—the chosen emblematic E. of the United States—is also an erne. What particular species was the emblematic E. of the ancients, is not more certain than what is the original emblematic Scotch thistle.—Others of the E. group of *Falconidæ* are known as marsh eagles, harpy eagles, eagle-hawks, ospreys, etc., for some of which see their titles: see also ACCIPITRES: BIRDS.

EA'GLE, as a Military Standard: adopted by the Romans, and even by nations preceding them in history. The Persians, in the time of Cyrus the Younger, bore an eagle on a spear as a standard. The Romans for some time used the eagle, the wolf, the boar, the horse, and the minotaur for standards, but afterward abandoned the last four, and confined themselves to the eagle. The Roman eagle, some times of gold, more frequently of silver, was about as large as a pigeon with extended wings, and was

borne on the top of a spear, with a cross-bar or a shield to support it. Someof the eagles were represented as holding thunderbolts in their talons, and usually bore the name of the legion to which each respectively belonged. The eagle was sometimes made of steel, but rarely.

Roman Eagle.

In modern times France, Russia, Prussia, Austria, and the United States, all have adopted the eagle as a national military symbol. The Austrian eagle is represented double-headed.

EA'GLE, BLACK, ORDER OF THE, in Prussia: founded by the Elector of Brandenburg 1701, Jan. 17, the day of his coronation as king of Prussia. The number of knights, in addition to the princes of the royal family, was originally 30, but is now unlimited. They must at their nomination be at least 30 years of age. They must prove their noble descent for four generations through both parents. A chapter is held twice a year.

The insignia of the order consist of an octagonal cross of blue enamel, and a black eagle displayed between each of the arms of the cross. The cross is suspended by a broad ribbon of orange color across the left shoulder, and is accompanied by an embroidered silver star, fastened on the

Star of the Order of the Black Eagle.

Ribbon and Cross of the Order of the Black Eagle.

left breast. The centre of the star represents a black flying-eagle, holding in one claw a laurel wreath, and in the other a thunderbolt, with the legend, *Suum cuique*. Fifty ducats must be paid by every new member for

the support of the orphan asylum at Königsberg, and he then receives gratis the costume and insignia of the order, of which a full description is given in Burke's *Orders of Knighthood*, p. 199. As the black eagle is the highest order in Prussia, no member of it, with the exception of foreign princes and knights of St. John, is permitted to wear any other order with it; and as it is generally granted only to those who are expected to be near the person of the king, no one who holds it is permitted to travel from the court more than 20 German miles without giving notice. Knights of the Black Eagle are likewise knights of the Red Eagle (q.v.), first class.

EA'GLE, RED, ORDER OF THE, in Prussia: founded 1734 by the Markgraf George Frederick Charles, as a reorganization of the 'Ordre de la Sincérité,' which had been instituted in the beginning of the century by the hereditary prince of Anspach and Baireuth. After various modifications, the order was raised 1791 by Frederick William II. to the rank of the second order in the monarchy, and it was then that the decoration of a white enamelled Maltese cross, surmounted by a royal crown, with the Brandenburg eagle in the corner, was adopted. All the knights of the Black Eagle were received into this new order; and it was latterly decreed that only those who had been decorated with the Red Eagle, in the first instance, could be received into the Black. In 1810, the order of the Red Eagle was reorganized, and two more classes were added to it. In 1830, the second class was subdivided into two, one of which only was allowed to wear a square star.

EA'GLE HAWK (*Morphuus* or *Spizaëtus*): genus or sub

Eagle-Hawk (*Morphuus cristatus*).

genus of *Falconidæ* of the eagle group, but consisting of species of comparatively small size, and characterized by

short wings, long slender legs (*tarsi*), and comparatively feeble toes and claws. Some of the species are extremely beautiful in form and colors. They are natives of warm climates, chiefly of S. America, but also of Africa and the E. Indies The Crested E. (*M. cristatus*) of Guiana, and the Brazilian E., or Urubitinga (*M. Urubitinga*), are examples. The latter, though not so large as a goose, is sometimes called the Brazilian Eagle.

Eagle Owl (*Bubo maximus*).

EA'GLE OWL (*Bubo*): genus of the owl (q.v.) family (*Strigidæ*), characterized by a somewhat incomplete facial disk, two tufts of feathers (*horns* or *egrets*) of considerable size on the head, ears with small openings (*conchs*), legs and toes covered with feathers, short strong curved bill, and long curved sharp claws. To this genus belong the largest nocturnal birds of prey. The E. O. of Europe (*B. maximus*) is little inferior in size to the Golden Eagle, and preys on quadrupeds such as hares, rabbits, and young deer, and on grouse, partridges, and other kinds of game. It seizes its prey with its feet, and seldom touches it with the bill till its struggles are over. It is an inhabitant of many parts of Europe and Asia, but is only a rare occasional visitor in Britain. The loud peculiar cry of this bird, resounding strangely through the night, has obtained for it its German name of *Uhu*, and an intimate association from time immemorial with evil omens and superstitious terrors.—The E. O. of America (*B. Virginianus*), the VIRGINIAN HORNED OWL or GREAT HORNED OWL, is very similar, but of inferior size, although a bold and powerful bird. It carries off with ease almost any inhabitant of the poultry-yard. It is found in almost all parts of America.

EAGRE, or EGRE, n. *ē′gẽr;* also spelled HYGRE or HIGRE, n. *hī′gẽr* [AS. *egor*, the sea, water. Icel. *ægir*, the god of the sea, the sea itself (see HIGRE)]: the English name applied to the tidal bore; a hollow and harsh roar caused in certain rivers by the rapid and violent advance of a spring-tide against the current of a river: see BORE 3.

EALING, *ē′lĭng:* town and parliamentary division in Middlesex, England, close to Brentford. The town has a free library, science and art schools, and a training college for teachers of the deaf. Pop. of town 23,979; of division 79,748.

EAMES, *ēmz*, CHARLES 1812, Mar. 20—1867, Mar. 16; b. New Braintree, Mass ; lawyer. He graduated at Harvard Univ. 1831, studied law in the Cambridge law school, and was admitted to the bar, but ill health prevented him from practicing. He received an appointment under the navy dept. 1845, became an editor of the Washington *Union*, was appointed by Pres. Polk a commissioner to negotiate a treaty with the Sandwich Islands, and on his return, 1851 edited the Nashville *Union* some time and then returned to the Washington *Union.* Pres. Pierce appointed him U. S. minister to Venezuela, where he remained till 1850, when he resigned. He again settled in Washington, began practicing his profession, and attained high rank as an admiralty lawyer. He was an accomplished scholar and linguist.

EAMES, EMMA, American operatic prima donna: b. Shanghai, China, 1867, Aug. 13. She studied music in Boston and Paris, singing in churches and concerts in the former city, and making her début in grand opera, Paris, 1889, March 13, in *Juliette*, appearing in grand opera at the Covent Garden, London, 1891, and in New York the same year, since which time she has been a popular member of grand opera companies in Europe and America. She married the well-known artist, Julian Story, 1891, but was divorced in 1907.

EAMES, WILBERFORCE, American bibliographer: b. Newark, N. J., 1855, Oct. 12. He has long been prominent in bibliographical matters, having been assistant at the Lenox Library, New York, 1885; assistant librarian 1892; librarian 1893-5, when upon the consolidation of the Astor Library and Tilden Trust as the New York Public Library, Astor, Lenox and Tilden Foundations, he became librarian of the Lenox branch. He edited volumes 15-20 of *Sabin's Dictionary of Books relating to America* (1885-92). Among his works are: *Bibliographies of the Bay Psalm Book* (1885); of *Ptolemy's Geography* (1886), and of *Sir Walter Raleigh;* bibliographic notes on *Eliot's Indian Bible* (1890), reprinted from *Pilling's Indian Biographies*, and a bibliographic account of the early catechisms of New England (1898).

EANING, n. *ēn′ĭng* [AS. *eanian*, to bring forth as a ewe; *ge-ean*, to yean: W. *oen;* Gael. *uan;* Manx, *eayn*, a lamb]: in *OE.*, the time when lambs were born. EANLINGS, n. plu. *ēn′lĭngs*, the lambs when born.

EAR, n. *ēr* [AS. *eare*, the ear: Icel. *eyra;* L. *auris;* Goth. *auso;* Ger. *ohr*, an ear]: the organ of hearing; the power or faculty of readily distinguishing musical sounds; in *music*, figurative for a sensitive, just, and delicate appreciation of sound and measure; attention; heed; regard; one of the projecting parts of a vessel used as handles; in *organ-building*, *ears* are small projecting pieces of metal on the sides of the mouths of metal pipes for assisting the pipes to speak promptly, especially when the organ is of small scale: the German term is 'beard.' EARED, a. *ērd*, having ears; in *her.*, epithet applied to animals borne in coat-armor having the ears of a different tincture from that of the rest of the body; in *bot.*, auriculate; having two small rounded lobes at the base, as the leaf of *Salvia officinalis;* having developed into ear, having the inflorescence fully formed; in *agri.*, a term applied at the stage when the leaf and ear differ in color. EARING, n. in *naut.*, the rope which lashes the upper corner of a sail to its yard. The reef-earings are used to lash the ends of the reef-band to the yard. EAR-LAP, n. the tip of the ear. EAR'LESS, a. without ears. EAR-MARK, n. in *law*, any mark made upon anything for the purpose of identification. EAR-PIERCING, very shrill. EAR-ACHE, *-āk*, pain in the ear. EAR-BONES, three small bones connected with the organs of hearing. EAR-DRUM, the membrane stretched across the internal ear, like the parchment of a drum; the tympanum. EAR-RING, a drop or pendant on the ear as an ornament. EAR-SHOT' n. hearing distance. EAR-SPECULUM, n. in *surg.*, instrument for distending the external canal of the ear, in removing indurated wax, or in other explorations and operations; an otoscope. EAR-TRUMPET, an instrument to enable the somewhat deaf to hear more distinctly. EAR-WAX, the thick brownish substance which gathers inside the ear. WITHIN EAR-SHOT, within reach of the hearing. EARWIG, n. [AS. *wigga*, a creeping thing]: an insect having a forked tail, supposed, but ignorantly, to enter the ear: V. to get into a person's confidence or good graces by telling tales of others. EAR'WIGGING, imp.: N. the gaining of confidence and good graces by whispered and covert statements about others. EAR'WIGGED, pp. *-wĭgd*. EAR-WITNESS, one who can testify from his own hearing; one who hears a thing. EAR OF DIONYSIUS, n. *dī-o-nĭsh'ĭ-us*, an acoustic instrument named after the sound-conducting orifice in the roof of the dungeons where the old Sicilian tyrant kept his prisoners. It has a large mouth-piece to collect the sound, which a flexible tube conducts to the ear of the person. It is especially adapted for enabling the very deaf to hear general conversation, lectures, sermons, etc. TO SET BY THE EARS, to make strife; to cause to quarrel. ABOUT YOUR EARS, beset or attacked, as for revenge. OVER-HEAD AND EARS, or UP TO THE EARS, in an extreme degree. A FLEA IN YOUR EAR, a cuff or box on the ear; a rebuff some sharp and disagreeable words.

EAR, n. *ēr* [AS. *eár* or *æchir;* Goth. *ahs;* Ger. *ahre* Dut. *ære*, an ear of corn]: the head or top part of corn con

taining seeds: V. to form ears, as corn. EAR'ING, imp. EARED, pp. *ērd:* ADJ. having ears.

EAR, v. *ēr* [AS. *erian* and *earian;* Gael. *ar;* Icel.*erja;* Dut. *eren;* L. *arārĕ*, to plow: Gr. *arŏō*, I plow]: in *OE.*, to plow; to cultivate. EARING, imp. *ēr'ĭng:* N. the plowing of fields. EARED, pp. *-ērd*, plowed; tilled—see Gen. xlv. 6; Ex. xxxiv. 21; frequently occurring in Shakespeare. EARABLE, a. *ēr'ă-bl*, capable of being plowed.

EAR, ANATOMY AND PHYSIOLOGY OF THE: structure and functions of the apparatus of hearing in man and the mammalia. The apparatus is composed of three parts—the external ear, the middle ear or tympanum, and the internal ear or labyrinth.

The *external ear* consists of two portions, the *auricle* or *pinna* (the part popularly recognized as the ear), and the *auditory canal* or *external meatus.*

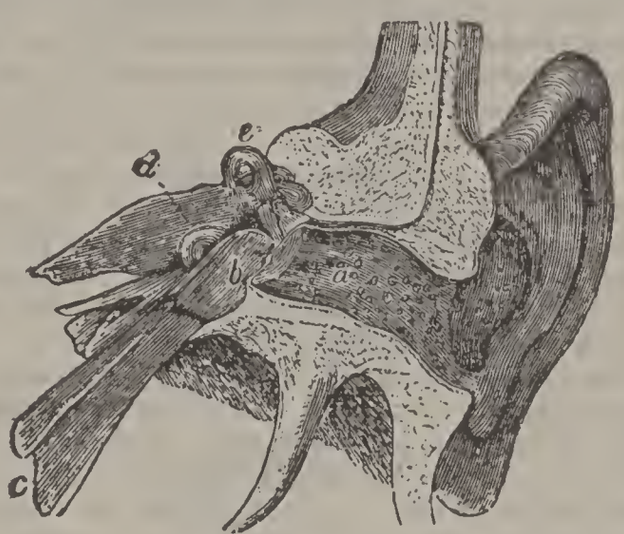


Fig. 1.

General view of the external, middle, and internal ear, showing the interior of the auditory canal, tympanic cavity, and Eustachian tube.

a, the auditory canal; *b*, the tympanum; *c*, the Eustachian tube, leading to the pharynx; *d*, the cochlea; and *e*, the semicircular canals and vestibule, seen on their exterior by the removal of the surrounding bony tissue.

The auricle, on its outer or more exposed surface, presents various eminences and depressions, resulting from the form of its cartilaginous framework. These have received special anatomical names, to which it is unnecessary to advert further than to mention that the deep capacious central space to which several grooves converge, is termed the *concha*, and that the lowest and pendulous portion of the ear is termed the *lobe.* The cartilage forming the basis of the external ear consists of one principal piece, in which there are several fissures, which are filled up by fibrous membrane. Several muscles are described as passing from one part of the auricle to another, but they are so little developed in man that they do not require notice; there are additionally three muscles—the *attollens aurem* (or *superior auris*), the *attrahens aurem* (or *anterior auris*),

and the *retrahens aurem* (or *posterior auris*), which pass from adjacent parts of the scalp to the ear, and which, though more developed than the previous group, are of little or no real importance in man, but are of considerable use in many mammals, in turning the auricle in the direction whence a sound comes. Their actions are sufficiently indicated by their names (*attollens*, raising; *attrahens*, drawing forward; *retrahens*, drawing backward).

The auditory canal passes from the concha inward, and a little forward, rather more than an inch. It is narrower at the middle than at either extremity; and on this account there is often considerable difficulty in extracting foreign bodies that have been inserted into it. The membrane of the tympanum which terminates it is placed obliquely, in consequence of the lower surface of the meatus being longer than the upper. The canal is partly cartilaginous and partly osseous; the osseous portion consisting, in the fœtus, of a ring of bone, across which the membrane is stretched, and in many animals remaining persistently as a separate bone. The orifice of the meatus is concealed by a pointed process, which projects from the facial direction over it like a valve, and which is called the *tragus*, probably from being sometimes covered with bristly hair like that of a goat (*tragos*); and it is further defended by an abundance of ceruminous glands, which furnish an adhesive, yellow, and bitter secretion (see CERUMEN), which entangles small insects, particles of dust, and other small foreign bodies, and prevents their further passage into the meatus.

The *middle ear*, or drum, or *cavity of the tympanum*, is a space filled with air received from the pharynx (q.v.) through the Eustachian tube (see fig. 1, *b*, *c*), and traversed by a chain of very small movable bonss (Fig. 2), which connect the membrane of the tympanum with the internal ear. It lies, as its name implies, between the external meatus and the labyrinth or internal ear, and opens posteriorly into the cells contained in the mastoid portion of the temporal bone, which also are filled with air, and anteriorly into the Eustachian tube. The cavity is of irregular shape, and is lined by a very delicate ciliated epithelium, a prolongation of that of the pharynx through the Eustachian tube.

Its external wall is mainly formed by the membrana tympani or drum membrane of the tympanum, which is nearly oval, and placed in a direction slanting inward to form an angle of about 45° with the floor of the auditory canal (see fig. 1). The handle of the malleus (or hammer), the first of the chain of ossicles (see fig. 2), is firmly attached to the inner side of this membrane in a vertical direction as far downward as the centre, and by drawing it inward, renders its external surface concave.

Its internal wall has two openings communicating with the internal ear, each of which is closed by a delicate membrane. These openings are termed, from their respective shapes, the *fenestra ovalis*, and the *fenestra rotunda;* the former leads to the vestibule, and is connected by its mem-

brane with the base of the stapes (or stirrup bone), the last of the chain of ossicles; while the latter opens into the cochlea.

The ossicles of the tympanum are three—viz., the *malleus*, the *incus* (or anvil), and the *stapes*. It was observed above that the malleus is connected with the membrane of the tympanum by its handle. Through this connection, the tension of that membrane may be modified by the agency of one or two muscles which are attached to this ossicle. These muscles are the *Laxator tympani*, which arises from the spinous process of the sphenoid bone (q.v.), and is inserted into the processus gracilis; and the *Tensor tympani*, which arises from the under surface of the petrous portion of the temporal bone, and is inserted into the handle of the malleus immediately below the commencement of the *processus gracilis*. The existence of the former of these muscles is doubtful, many anatomists regarding the structure in question as ligamentous rather than muscular. The mode in which this bone articulates with

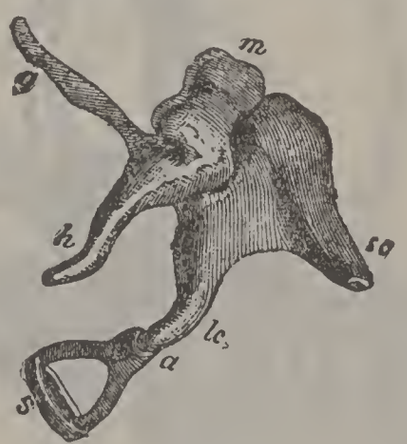


Fig. 2.

Ossicles of the left ear, as seen from the outside and below.

m, head of the malleus; *g*, the slender process, or *processus gracilis; h*, th manubrium or handle; *sc*, the short crus, and *lc*, the long crus of the incus; *a*, the position of the lenticular process, through the medium of which it articulates with the head of the stapes; *s*, the base of the stapes. Magnified three diameters.

the incus is sufficiently explained by the figure. The *incus* much more closely resembles a molar tooth with two fangs, than the anvil from which it derives its name. Of the two processes which it gives off (see fig. 2), the short one, *sc*, runs backward, and projects into the mastoid cells behind the tympanic cavity; while the long one, *lc*, inclines downward, and terminates in the lenticular or orbicular process, *a*, to which the head of the stapes is attached. The *stapes* has a head, neck, two branches, and a base, which, as has been already mentioned, fits into the fenestra ovalis. A minute muscle, the *stapedius*, takes its origin from a hollow conical eminence termed the *pyramid*, behind the *fenestra ovalis*, and is inserted into the neck of the stapes; by pulling the neck backward, it probably compresses the contents of the vestibule.

The Eustachian tube, into which the tympanic cavity opens anteriorly, is about an inch and a half in length, and passes downward, forward, and inward, to its opening in the pharynx. It is partly bony, but chiefly cartilaginous. Its use is to allow the free passage of air in and out of the tympanum, and to admit of the egress of the mucus secreted in that cavity.

The *internal ear* or *labyrinth* is the essential part of the organ of hearing, being the portion to which the ultimate filaments of the auditory nerve (q.v.) are distributed. It is composed of three parts—viz., the *vestibule*, the *semicircular canals*, and the *cochlea*, which form a series of cavities presenting a very complicated arrangement, and lying imbedded in the hardest part of the petrous portion of the temporal bone. They communicate externally with the tympanum by the two openings already described—the *fenestra ovalis*, and the *fenestra rotunda;* and internally

Fig. 3.

Interior of the Osseous Labyrinth:

V vestibule; *av*, aqueduct of the vestibule; *o*, fovea semi-elliptica; *r*, fovea hemispherica; S, semicircular canals; *s*. superior; *p*. posterior; *i*, inferior; *a*, *a*, *a*, the ampullar extremity of each; C, the cochlea; *sv*, osseous zone of the lamina spiralis, above which is the scala vestibuli, communicating with the vestibule; *st*, scala tympani, below the spiral lamina. Magnified 3½ diameters.

with the internal auditory canal, which conveys the auditory nerve from the cranial cavity to the internal ear. The very dense bone immediately bounding these cavities is termed the *osseous labyrinth*, to distinguish it from the *membranous labyrinth*, which lies within a portion of it.

The *vestibule* is a common central cavity into which the semicircular canals and the cochlea open (see fig. 3, V). It is about a fifth of an inch in height and in length from before backward, its transverse diameter (from side to side) being somewhat less. On its posterior wall are five orifices for the semicircular canals, one of the orifices being common to two of the canals. Anteriorly, the cochlea enters it by a single opening, the beginning of the *scala vestibuli*. On

its outer wall is the *fenestra ovalis*, and on its inner are the *fovea hemispherica*, containing several minute orifices for the entrance of filaments of the auditory nerve, and the fovea semi-elliptica.

The *semicircular canals* are three in number, and open at both ends into the vestibule. They vary in length, and notwithstanding their name, each is considerably more than a semicircle, the superior vertical canal being the longest. Their average diameter is about a twentieth of an inch, the extremity of each canal having a dilatation or *ampulla*. Each canal lies in a different plane, very nearly at right angles to the planes of the other two, hence their names of the *superior vertical*, the *inferior vertical*, and the *horizontal canals*.

The *cochlea*, which derives its name from its resemblance to a common snail-shell, forms the anterior portion of the

Fig. 4.

Membranous Labyrinth of the Left Side, with its Nerves and Otoliths.

sw, superior semicircular canal, with the ampulla and its nerve at one end, and the other end joined by *p*, the posterior canal, to form a common tube; *i*, inferior or horizontal canal, with the ampulla and its nerve at one end, and the other entering the utriculus separately; *c*, powdery otolith seen through the transparent wall of the utriculus or common sinus; *s*, powdery otolith of the sacculus, seen with its nerve in a similar way; *n*, cochlear division of the auditory nerve, cut through; *d*, *portio dura*, or facial nerve, leaving the auditory nerve, or *portio mollis*, to enter the aqueduct of Fallopius. Magnified.

labyrinth. It consists of an osseous and gradually tapering canal, about an inch and a half in length, which makes two turns and a half spirally around a central axis, termed the *modiolus*, which is perforated at its base for the entrance of the filaments of the cochlear portion of the auditory nerve. This spiral canal gradually diminishes toward the apex of the cochlea. At its base, it presents two openings, one into the vestibule, the other (closed by a membrane,

and communicating with the tympanum) being the *fenestra rotunda* already described. Its interior is subdivided into two passages (*scalæ*) by an osseo-membranous lamina. This is the *lamina spiralis*, which divides the cochlea into an upper passage, the *scala vestibuli*, and a lower, the *scala tympani*. At the apex, these two passages communicate by an opening to which the term *helicotrema* has been applied. Between the two scalæ, there is a third space termed the *ductus cochlearis*, or *scala intermedia*. In this space the filaments of the auditory nerve terminate, by being connected with a complicated arrangement of peculiarly formed epithelial cells, constituting the organ of Corti. For a notice of the membranous portion of the *lamina spiralis*, see AUDITORY NERVE.

We now return to the *membranous labyrinth*. The membranous and osseous labyrinths have the same shape, but the former is considerably smaller than the latter, a fluid termed the *perilymph*, intervening in some quantity between them. At certain points, recent investigations have shown that the membranous is firmly adherent to the inner surface of the osseous labyrinth. The vestibular portion consists of two sacs, an upper and larger one, of an oval shape termed the *utriculus*, or *common sinus*, and a lower and smaller one of a more globular shape, called the *sacculus*.

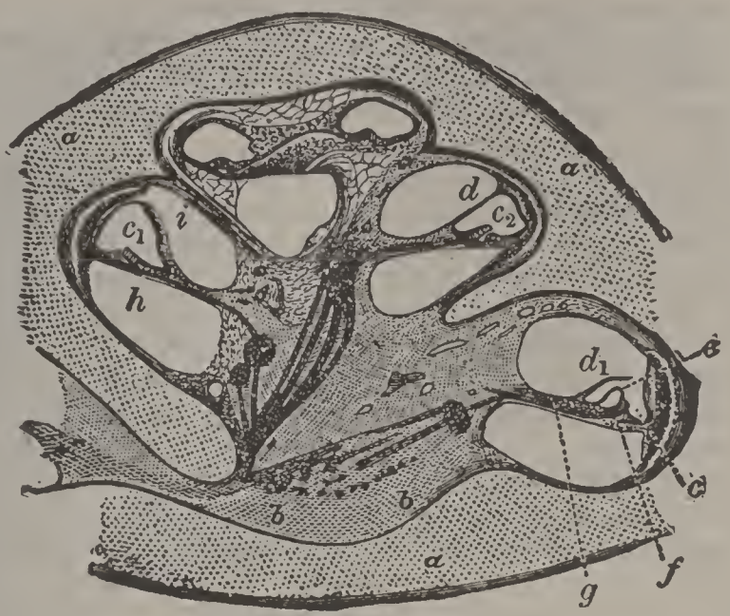
The membranous semicircular canals resemble in form and arrangement the osseous canals which inclose them, but are only one-third of the diameter of the latter. The ultimate filaments of the auditory nerve (q.v.) mainly go (see fig. 4) to the utriculus, to the sacculus, and to the ampulla of the canals.

The membranous labyrinth is filled by a fluid termed the *endolymph;* and in certain spots, especially at the terminations of the vestibular nerves, both in man in the lower animals, calcareous matter either in a powdered or solid form is found. In man and mammals generally, and in birds and reptiles, it occurs as a powder, and is termed *otoconia* or *ear-powder*, and it always consists of carbonate of lime.

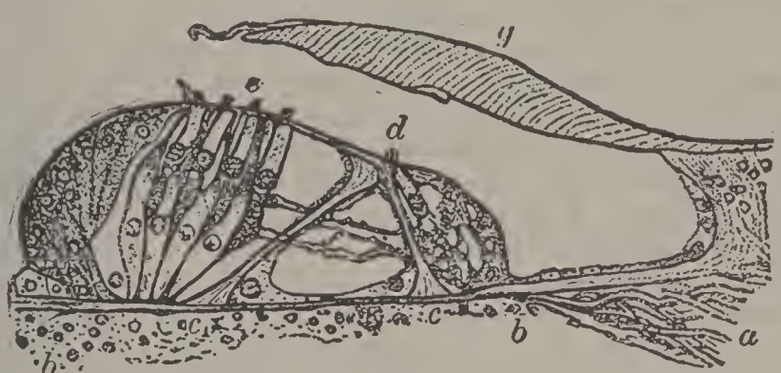
We now proceed to the different functions or offices of the various parts of the organ of hearing.

1. *Of the External Ear.*—A true auricle exists only in the mammalia, and in this class it varies from little more than an irregularly shaped cartilaginous disk, with little or no motion, as in man and the quadrumana, to an elongated funnel-shaped ear-trumpet, movable in all directions by numerous large muscles, as in the horse, the ass, and the bat.

The mode in which we see it employed by these animals in which it is highly developed, sufficiently indicates that its main function is to collect and concentrate the sounds which fall upon it. But the experimental investigations of Savart, with an apparatus constructed to resemble the tympanic membrane and the external auditory apparatus, show that these parts are adapted also to enter into vibrations in unison with those of the air; and he suggested that the human auricle, by the various directions of different



Section through the Cochlea of a Human Embryo; *a*, *a*, *a*, Cartilage, which afterward ossifies; *b*, *b*, Tissue, which afterward becomes the modiolus; *c*–*c2*, Duct of the cochlea; *d*, *d1*. Membrane of Reissner; *e*, Membrane tectatoria, rather elevated from its proper position; *f*, Position afterward occupied by organ of Corti; *g*, Lamina spiralis; *h*, Scala tympani; *i*, Scala vestibuli.



a, Lamina spiralis ossea, with nerve bundles from cochlear nerve; *b*, *b*, Lamina spiralis membranacea; *c*, Inner rod or pillar of Corti; *c1*. Outer rod or pillar of Corti; *d*, Inner hair-cell; *e*, Outer hair-cells; *f*, Nerve fibres; *g*, Membrana tectatoria.

Parts of the Human Ear: C, Concha; *a*, Helix; *b*, Lobe; *c*, Antihelix; *d*, Antitragus; *e*, Tragus; *f*, Crura of antihelix; *g*, Fossa navicularis; *h*, Fossa innominata; *k*, Auditory opening; *l*, Scala; *m*, Cochlea; *n*, Vestibule; *o*, Semicircular canals; *p*, Incus or anvil; *q*, Stapes or stirrup; *r*, Malleus or hammer; *s*, Membrane of the tympanum or drum.

parts of its surface, could always present to the air a certain number of parts whose direction is at right angles with that of the molecular movement of that fluid, and therefore in the most favorable position for entering into vibrations with it.

2. *Of the Tympanum and its Contents.*—Savart's experiments show that the membrane of the tympanum is thrown into vibration by the air; and that it always executes vibrations equal in number to those of the sonorous body which excites the oscillations in the air. He further ascertained that the malleus participates in the oscillations of the tympanic membrane, and that these vibrations are propagated to the incus and stapes, and thus to the membrane of the fenestra ovalis. The malleus has further the office of regulating, through the *tensor tympani* muscle, the tension of the tympanic membrane; and to allow of the motion necessary for this purpose, we find movable joints between it and the incus, and again between the latter bone and the stapes. The contraction of the stapedius muscle similarly modifies the tension of the membrane of the *fenestra ovalis;* and as compression exercised on this membrane extends to the perilymph, and is propagated through it to the *fenestra rotunda*, the tension of the membrane of the latter opening is also influenced by the muscle in question. The incus is much more limited in its motions than either of the other bones, and its use seems to be to complete the chain of ossicles in such a manner as to prevent any sudden or violent tension of the membranes, such as we can easily conceive might occur, if the conductor between the membranes were a single bone. The presence of air in the tympanic cavity serves a double purpose: in the first place, it preserves a uniform temperature on the outer surfaces of the fenestral membranes, and thus supports a fixed elasticity in them, which would not be the case if they were freely exposed to ordinary atmospheric changes; and secondly, the action of the chain of ossicles as conductors of sound is materially increased by their being completely surrounded by air, as is obvious from the first principles of acoustics.

3. *Of the Labyrinth.*—Sound is conducted to the labyrinth in three ways: first, by the chain of bones; secondly, by the air in the tympanic cavity; and thirdly, through the bones of the head.

Müller has shown, by very ingenious experiments on an apparatus constructed to resemble, on a large scale, the middle and internal ear, that while the air in the tympanum conducts sound to the cochlea, through the *fenestra rotunda*, the chain of bones forms a much better conductor of it to the vestibule, through the *fenestra ovalis.* Hence, we infer that the vestibule is adapted to receive sounds from the membrane of the tympanum and the external ear, while the cochlea, on the other hand, as its structure and connections indicate, may be regarded as that part of the labyrinth which is specially affected by sounds communicated through the bones of the head.

That the vestibule is the essential or fundamental part of the organ of hearing, is sufficiently proved by its constancy,

other parts gradually disappearing as we descend the animal scale, and by its central position in the ears of the higher animals. The use of the otoconia or ear-powder is to strengthen the sonorous undulations, and to communicate to the membranous vestibule and ampullæ, and to their nerves, stronger impulses than the perilymph alone could impart. The action of otoliths or ear-stones, such as occur in osseous fishes, must be still more decided, and is well illustrated by the following experiment of Camper. Fill a bladder with water and place a pebble in it. The slightest impulse communicated to the bladder disturbs the pebble, which consequently produces a greater impression on the hand supporting the bladder than the water alone could do.

Nothing certain is known regarding the functions of the semicircular canals, but their constant existence and number in the vertebrated animals indicate their importance; and in most cases of congenital deafness they are more or less defective. Perhaps among vertebrates the only exceptions to their constant presence are the myxine or hag(with only one semicircular canal), and the lamprey (with only two)—both, fishes of very low organization. The correspondence of the position of these canals with the three dimensions of a cube—its length, breadth, and height—has led to the opinion that they are concerned in conveying a knowledge of the direction of sounds. This view is supported by Prof. Wheatstone, who believes that we distinguish best the direction of those sounds which are sufficiently intense to affect the bones of the head, and that it is from the vibrations transmitted through these bones that our perception of direction is obtained. Cutting one or more of the semicircular canals in an animal results in staggering dizziness, or loss of the sense of level, which is part of the sense of direction. It is thought that movement of lymph in this or that canal according to movement or position of the head, may affect the sense of level, and explain a loss of it when the canals are cut. As to the rods of Corti, like a series of rafters of varying length, the apex at *b* (Fig. 2, Plate 5), and which have been compared to harp-strings, the only hypothesis is that certain lengths respond to pitch of sound.

The range of hearing, like that of vision, varies remarkably. The ordinary range of human hearing comprised between the lowest notes of the organ and the highest sound of insects, includes, according to Wollaston, more than nine octaves, all of which are distinctly perceptible by most ears. He relates, however, several cases in which the range, in reference to the perception of high notes was much less. In one individual, the sense of hearing terminated at a note four octaves above the middle E of the pianoforte, the F above it being inaudible, though his hearing in other respects was as perfect as that of persons in general; another case was that of a lady who could never hear the chirping of the field-cricket; and in a third case the chirping of the common house-sparrow could not be heard.

EAR, DISEASES OF THE. The disease of the ear will be considered under three divisions, namely, (1) Diseases of the External Ear, (2) Diseases of the Middle Ear, and (3) Diseases of the Internal Ear.

I. THE EXTERNAL EAR.—*Cerumen or wax* in the external auditory canal is a normal condition, probably being a provision on the part of Nature to prevent the entrance of insects into the auditory canal. The waxy secretion is ordinarily thrown off with the dry scales of epidermis, and does not accumulate in the auditory canal. In some persons it is secreted in excessive quantity and more or less fills the canal. When thus accumulated it may harden and render the patient more or less deaf. The ceruminous glands which secrete the brown wax are located in the skin of the outer half of the auditory canal, hence the waxy secretion is limited to this portion of the canal. In attempting to remove the cerumen, the patient often pushes the ceruminous plug into the deeper portion of the canal against the drumhead, thereby greatly increasing the degree of deafness.

The treatment should consist in syringing the auditory canal with warm water, to which two teaspoonfuls of bicarbonate of sodium (common cooking soda) should be added to each quart of water used. It may be necessary to use three or four quarts of water to soften and disintegrate the cerumen or wax. The patient should never use a hairpin, match, or toothpick to remove the wax, as great damage may thereby be inflicted upon the drumhead and middle ear. If the syringe does not remove the wax and restore the hearing, a physician should be consulted.

Foreign bodies in the ear are usually located in the external auditory canal. They may be animate or inanimate. Inanimate bodies, such as beans, grains of corn, wheat, etc., are often difficult to remove on account of their shape and smooth surface. If the foreign body does not readily fall from the auditory canal a physician should be consulted.

Animate (live) foreign bodies in the auditory canal cause most distressing pain and noises in the ear on account of the bug, insect, or other live object scratching the drumhead. It is difficult to remove a live bug from the ear, hence the best thing to do is first to drown, and then to remove it. Indeed, the insect is often removed in the process of drowning, provided the water is introduced into the external auditory canal with a syringe. Maggots in the ear (the larvæ of certain flies) should first be killed with chloroform, after which they may be removed by syringing with water.

The skin of the external ear and auditory canal is subject to the inflammatory diseases and tumors peculiar to the skin of other parts of the body.

II. THE MIDDLE EAR.—*Catarrh of the middle ear* (*Otitis Media Catarrhalis*) is an inflammatory process affecting the mucous membrane with which the middle-ear cavity (tympanum or tympanic cavity) is lined. Catarrhal inflammation is characterized by an increased redness

(hyperæmia) of the mucous membrane and an increase in the secretion of mucus. Deafness is more or less pronounced and noises in the head (tinnitus) are complained of.

The *causes* (*etiology*) *of catarrhal inflammation* are various though it is usually due to preexisting diseases of the nose and throat. The middle-ear cavity communicates with the upper part of the throat (nasopharynx, epipharynx) *via* the Eustachian tube (see EAR, ANATOMY OF THE). The mucous membrane of the middle ear is continuous with that of the Eustachian tube and the throat, hence according to a well-recognized pathogenic law, an inflammation of the mucous membrane of the throat extends to the Eustachian tube, and from thence to the middle ear. As the mucous membrane of the nose is continuous with that of the throat it follows that inflammation of the nasal mucous membrane extends by continuity of tissue to the Eustachian tube and middle ear. In addition to the inflammatory disease of the nose and throat, any condition that causes obstruction to the drainage of the secretions and the ventilation of the middle-ear cavity, predisposes to catarrhal and suppurative inflammation of the middle ear. In infants and children adenoids (see THROAT, DISEASES OF THE) are a frequent cause of obstruction to the Eustachian tube, and therefore often cause catarrhal or even suppurative inflammation of the middle ear. Certain conditions, external to the body, as exposure to draughts, inclement weather, wet cold feet, too much or too little clothing, etc., may also cause middle ear inflammation.

The symptoms or signs of catarrhal inflammation should be grouped under two headings, namely Symptoms of Acute Inflammation, and Symptoms of Chronic Inflammation.

The chief *symptoms of acute catarrhal inflammation* of the middle ear are pain, more or less deafness, head noises, and fever. The pain is located deep in the ear, and is not increased by moving external ear (auricle) as is the case in boils (furuncles) of the external auditory canal. Upon inspection through the external auditory canal the drumhead (membrana tympani) is seen to be red, or, if the secretions in the middle ear are abundant, it may be greenish yellow and bulging.

The chief *symptoms of chronic catarrhal inflammation* are deafness and noises in the head. Pain and fever are usually absent. Upon inspection the drumhead is almost normal in color, and, instead of bulging as in acute otitis media, it is often retracted. The retraction is due to the closure of the Eustachian tube, a condition which prevents the entrance of air into the middle-ear cavity from the throat. The air, or rather the oxygen of the air in the middle ear is gradually absorbed by the blood in the vessels of the mucous membrane, and thus becomes rarefied. The negative pressure thus created in the middle-ear cavity allows the air on the outside of the drumhead to

push it inwards, thus producing the appearance of retraction.

Certain functional tests of hearing are usually employed by aurists in diagnosing the location and nature of the ear disease. Specially devised tuning forks, whistles, etc., are used for this purpose. If the disease is located in the middle ear the hearing by bone conduction is prolonged and increased in intensity, whereas, if the disease is in the labyrinth or internal ear (nervous apparatus of the ear), the hearing by bone conduction is greatly diminished or altogether lost. In middle-ear disease hearing for the lower tones of the range of hearing are lost, whereas in labyrinth disease the upper tones of the range of hearing are lost.

The *prognosis* or prospect of the cure in acute middle-ear inflammation is good if the proper treatment is given early in the disease. If this is neglected the inflammation often terminates in a suppurative (pus producing) inflammation, or in the chronic form of catarrhal inflammation.

The *treatment* of the acute catarrhal middle-ear inflammation should be carried out under the direction of a physician, preferably an aurist, as it may be necessary to incise the drumhead to evacuate the secretions and promote the reaction of inflammation.

The surgeon may also find it necessary to correct the diseased conditions of the nose and throat which predispose to the middle-ear inflammation in order to prevent recurrences of the acute ear inflammation. The safest and best home treatment consists in dropping a five to twelve per cent solution of carbolic acid in glycerine into the external auditory canal, allowing it to remain in contact with the drumhead for an hour, the patient reclining with the affected ear upwards. At the end of an hour the canal should be closed with sterilized cotton to keep the air from the inflamed drumhead. The carbol-glycerin may be thus used two or three times daily until relief is experienced.

The treatment of chronic catarrhal inflammation of the middle ear consists in the removal of the diseases and obstructive lesions of the nose and throat which predispose to the catarrhal inflammation of the Eustachian tube and middle ear, and in inflating the middle ear through the Eustachian tube. These procedures should be done by the attending physician. Inflation should be practiced three times a week for a period not longer than six weeks, as to continue it longer would unduly stretch the drumhead and cause it to undergo atrophy or wasting of its tissue. Rest in bed with passive exercises (massage) will often improve the hearing. A sponge bath or cold plunge in a tub of water each morning will improve the general tone of the body and thus improve the hearing.

Suppurative Inflammation of the Ear (*Suppurative Otitis Media*).—Suppurative otitis media is characterized by the formation and discharge of pus from the middle-ear cavity into the external auditory canal. The disease may occur in the acute or chronic form.

The predisposing causes of this form of ear disease, are the same as those given in catarrhal inflammation of the middle ear, while the exciting cause is one or more of the pus producing pathogenic bacteria, as the streptococcus, staphylococcus, pneumococcus, and the influenza bacillus. The disease, therefore, often follows an attack of scarlet fever, measles, pneumonia, typhoid fever, or influenza. It also follows an attack of coryza (cold in the head) the active or exciting cause of which may be one or a combination of several of the forementioned pathogenic bacteria. Chronic suppurative otitis media is the sequel of the acute form of the disease and is due to a less poisonous or noxious type of the bacteria which caused the acute disease, or as often happens, to pure cultures of the staphylococcus, a pathogenic microorganism which, when acting alone, often perpetuates a chronic type of suppurative inflammation. The most important predisposing cause of suppurative inflammation is obstruction to the free drainage of the secretions from the middle-ear cavity. (See section Causes of Catarrhal Inflammation of the Middle Ear.)

The *symptoms of acute suppurative inflammation* of the middle ear are similar in many respects to those of acute catarrhal inflammation, though more pronounced. Pain referred to the ear, elevation of temperature, etc., are present. The drumhead in the stage before it is perforated is greenish yellow at the most bulging portion, on account of the pus in the middle ear. After the drumhead is perforated or ruptured by the pent up pus, the external auditory canal is filled with yellow pus, more or less admixed with mucus.

The *symptoms of chronic inflammation* of the middle ear are intermittent or continuous discharge of pus, with or without pain in the ear. The temperature is usually normal. Deafness in some degree is usually present, and is more marked during the periods of acute recurrent symptoms. A vibrating tuning fork or watch held against the mastoid process back of the auricle (bone condition), is heard with increased intensity and duration in the affected ear. If the fork or watch is placed on the top of the head or against the teeth, it is heard the loudest in the affected ear. This is true of nearly all diseases limited to the middle ear. The tones of the lower register of hearing are lost, while the highest musical tones appreciable by the human ear are heard. Should the opposite of these results be obtained the labyrinth or auditory nerve endings are probably affected; that is, the infection has gained entrance to the labyrinth or nervous portion of the ear. When granulations (aural polypi) are present in the middle-ear cavity they usually indicate the presence of bare or dead bone (necrosis) in the ear. A bloody discharge from the ear also denotes the same condition.

The *treatment of the acute type* of the disease in the early stage, before pus has actually formed in the middle-ear, consists in such remedial measures as will increase the nutrition, and the number of white blood corpuscles (leucocytes) in the affected tissues. By increasing the

nutrition of the affected tissues the cells composing the tissues are made stronger and more able to withstand the destructive agencies (toxins or poisons) thrown off by the infective or pathogenic bacteria. The white blood corpuscles are the scavengers and the germ destroying agencies of the body, hence, by increasing their number in the diseased tissues the germs are destroyed and the inflammation subsides. Laboratory experiments and clinical observations have shown that the application of leeches, scarification of the skin, or heat in the immediate vicinity of the inflamed tissues will increase the amount of blood (nutrition) and the number of white blood corpuscles in the diseased tissues. From two to five leeches should be applied to the skin back of the external ear (auricle) and left there until they fill themselves with blood and drop off of their own accord. The increased hyperæmia (determination of blood to a part), and migration of white blood corpuscles thus attracted to the infected and inflamed mucous membrane of the middle ear, often speedily bring about a cure. Of all the remedies known leeching is one of the most effective in the early (painful) stage of suppurative otitis media. Incision of the drumhead is perhaps the most speedy and effective mode of treatment. Syringing the ear (external auditory canal) with water as hot as it can be borne is also an effective remedy if used in the painful stage before the drumhead is ruptured. A fountain syringe, such as is to be found in nearly every household, is the best form of syringe to use. The bag should be held a little higher than the head of the patient and the water allowed to gently irrigate the external canal of the ear. From one to two quarts of water may be thus used every three hours until the pain subsides or the drumhead ruptures. Free incision of the drumhead by a skilled physician under strict aseptic precautions should be performed as soon as possible, as to wait for spontaneous rupture will result in greater damage to the contents of the middle-ear cavity. A ten per cent glycerin solution of carbolic acid dropped into the ear during the painful stage before rupture of the drumhead occurs, often aborts the disease, prevents rupture of the drumhead, and other destructive processes.

As the acute form of this disease is liable to destroy the hearing and to extend to the brain and cause meningitis, or abscess of the brain, a competent physician should be consulted without delay and the treatment be carried out under his direction.

The *treatment of chronic suppurative otitis media* is not usually as effective as in the acute form of the disease. The remedial measures given for the acute form of the disease are not applicable to the chronic type of inflammation, as the characteristics of chronic inflammation differ very distinctly from those of acute inflammation. Continued cleanliness of the ear procured by repeated mopping with a small cotton wound probe in the hands of a physician, sometimes brings about great improvement, though a cure rarely results. Many local remedies, as

alcohol, boric acid powder, a solution of oxygen, etc., exert more or less beneficial effect, though they rarely cure. To effect a cure it is often necessary to resort to a surgical operation.

While chronic ear discharge (otorrhœa) is often tolerated for many years without serious consequences, it is nevertheless a constant menace to health and life, dangerous intracranial and mastoid complications often developing without warning. Chronic ear discharge usually signifies the presence of dead bone in the ear or the mastoid process. As the bone dies (ulcerates) the neighboring structures, such as the brain and the large veins at the base of the skull, are exposed to the pathogenic bacteria (disease producing germs) present in the middle ear, and meningitis (brain fever) or thrombophlebitis (infected clot in the vein) result and often lead to a fatal issue.

The chronic form of this disease, while apparently much more simple and less harmful than the acute form, is, in reality, more complex and more dangerous. The treatment should be entrusted to a competent aural surgeon.

Cholesteatoma is a tumorous mass of exfoliated flat epithelial cells intermingled with cholesterin crystals. The cholesteatoma may form in the middle-ear cavity and extend outward into the external auditory canal, or into the deeper air spaces in or near the temporal bone, as the antrum and mastoid cells. In exceptional cases it extends into the brain substance through a carious opening in the plate of bone separating the ear cavity from the brain.

The *symptoms of cholesteatoma* are deafness, noises in the head (tinnitus), and, when infection is added, the usual signs of chronic suppurative middle-ear inflammation. When the cholesteatoma extends into the external auditory canal it is often mistaken for wax (cerumen) in the ear. Cerumen is brown, whereas the cholesteatoma is white or greyish in color. Cholesteatoma is a serious disease, whereas cerumen in the auditory canal is attended by no serious results other than a degree of deafness.

The complications and sequelæ of suppurative inflammation of the middle ear, rather than the infection of the ear *per se*, constitute the real danger of the disease. So long as the inflammation is limited to the middle ear cavity the danger to health and life is slight. When, however, the infection extends to the mastoid cells back of the ear, and to the cranial cavity and the large veins at the base of the skull, the danger to life is often great. The following complications and sequelæ are frequently present:

Mastoiditis is an infectious inflammation of the mucous membrane lining the air spaces or cells in the mastoid process of the temporal bone. The inflammation may be catarrhal or suppurative, and acute or chronic in type. Suppurative inflammation of the mastoid cells is the type of disease usually requiring medical or surgical interference, hence it is to this type of mastoiditis reference is made in this article.

The cause of mastoiditis is the extension of the infection and inflammation from the middle ear to the mastoid antrum and cells. The middle-ear cavity communicates with the mastoid antrum and cells through a narrow canal called the *aditus ad antrum*, or way to the antrum, and during an acute infection of the middle ear, the germs pass through this canal into the air spaces of the mastoid antrum, and excite an inflammation which is known as mastoiditis.

The *symptoms of acute mastoiditis* are pain, tenderness, and swelling in the mastoid region (back of the ear). There is also a more or less continuous discharge of pus through the external auditory canal. Fever is present, but gradually subsides after the first three or four days. If the lateral sinus (a large vein at the base of the skull in close apposition to the inner mastoid cells) becomes infected, there will be a chill followed by a rapid and extreme rise of temperature to about 104° Fahrenheit, followed by a more gradual decline. A second chill and extreme rise of temperature is an almost certain sign of infection and of thrombosis of the lateral sinus, and an operation should be performed at once, as delay would almost certainly be followed by death. (See below, *Thrombosis of the Lateral Sinus*).

The *symptoms of chronic mastoiditis* are usually limited to a fetid discharge of pus from the ear. There is no fever, pain, or tenderness on pressure over the mastoid process. In some cases acute symptoms develop at intervals of months or years, and during these exacerbations the symptoms are quite similar to those of acute mastoiditis. Chronic mastoiditis with acute exacerbations is a much more serious disease than acute mastoiditis, as after two or more years of purulent discharge from the ear, dead bone (necrosed bone) is present in the middle ear or mastoid antrum and cells. The liability of the infection extending to the brain and to the large vein at the base of the skull is greatly increased by the areas of necrosed bone. One writer has likened patients with chronic discharge from the ear, to persons going about with a charge of dynamite in their heads, not knowing when it would explode. It is popularly believed that because the discharge is chronic or has existed for a long time the danger is slight. As stated above the chronicity is an evidence of dead bone in the ear cavities, a condition which can be removed only by surgical interference: A persistent, though intermittent, discharge of pus from the ear should often be regarded as an indication of chronic mastoiditis complicating a similar pathological process in the middle ear.

The *treatment of mastoiditis* is chiefly surgical and need not be discussed here. A remedy of great value in the very early stage of acute mastoiditis is the application of leeches over the mastoid process. Heat from a hotbag or other device will afford some relief. Crushed ice in a rubber bag applied over the mastoid process has long been used to check the inflammation. The treatment

should always be carried out under the direction of a physician, as the disease is too grave to warrant dependance upon home treatment.

Thrombosis of the Lateral Sinus.—A thrombus is an infected clot in a blood-vessel. Thrombosis of the lateral sinus, a large vein at the base of the skull in close proximity to the mastoid cells, is a comparatively frequent complication of mastoiditis, and it places the life of the patient in great danger. It is characterized by a chill followed by a rapid and extreme rise in the temperature, which declines within ten to twelve hours to near the normal. The same clinical phenomena may recur at intervals of twenty to thirty hours, and if surgical procedures are not instituted for its cure, finally ends in death from profound sepsis or blood poisoning.

The chills and extreme rise in temperature are caused by the sudden distribution of infective material, as pathogenic germs, tissue debris and toxins (poisonous ferment of the germs) into the blood currents by the disintegration of the infected clot.

The *treatment* consists in performing a mastoid operation, and exposing the infected lateral sinus by removing its bony covering and freely incising the vein and removing the infected clot (thrombus) from it. The lateral sinus (vein) is then packed with sterile gauze and the mastoid wound is treated in the usual manner. Such a method of procedure often saves the life of the patient.

The thrombus may extend downward in the jugular vein, which is a continuation of the lateral sinus, and thus greatly increase the danger by spreading the infection to the lungs, liver, spleen, and other organs of the body.

Meningitis or Brain Fever.—Meningitis is often due to an invasion of the cranial cavity by the pathogenic bacteria or germs from the ear and mastoid cells. The bacteria excite a violent inflammation of the membranes covering the brain and the condition is known as meningitis.

The chief *symptoms of meningitis* are an intense headache, a moderate elevation of temperature, an intolerance of light (photophobia) strabismus or cross eye (occasionally present), etc. The symptoms depend so much upon the area of the meninges involved that a description of them is suitable only for a technical treatise upon the subject.

Death usually follows, except in serous meningitis, in which the mastoid operation and exposure of the base of the brain through the roof of the tympanic cavity, liberates the fluid and ends favorably. In the purulent variety of meningitis death is the rule, though a number of cases of recovery are on record. A rubber bag partially filled with crushed ice should be kept on the patient's head.

Abcess of the brain is frequently of otitic origin by extension from an infective inflammation of the middle ear and mastoid process. When the amount of pus steadily increases and encroaches upon the vital centers of the

brain the evil consequences are serious and imminent. When, however, the abscess is latent or chronic, the walls containing the pus become thickened and reenforced by the deposit of fibrous connective tissue. When thus walled off the abscess may cause but slight symptoms, such as a dull headache and an intermittent discharge of foul smelling pus from the ear. The pus often flows from the brain abscess into the mastoid cells or middle ear cavity, and from thence to the external auditory meatus. In acute cases there is a slight fever, whereas in the latent or chronic cases the temperature is normal or even below normal.

Formerly abscess of the brain was regarded as necessarily fatal. Modern surgical procedures under aseptic precautions have reversed the former opinion, as more than half of the cases may be completely cured by their application.

III. *The Labyrinth or Internal Ear.*—The labyrinth is a complex organ located in the petrous (stone-like) portion of the temporal bone, and its essential structures are the terminal endings of the auditory nerve, or nerve of hearing, and the three semicircular canals which are believed to preside over the function of equilibrium (see EAR, ANATOMY OF THE; AND EAR, PHYSIOLOGY OF THE). When pathogenic or disease-producing germs gain entrance to the labyrinth they may readily enter the cranial cavity through the bony canal (internal auditory canal) through which the auditory nerve passes to the labyrinth. Other affections of the labyrinth which are not of infectious origin impair the hearing. For these reasons the diseases of the labyrinth are of great clinical importance. The labyrinth is so deeply hidden in the petrous portion of the temporal bone, that when diseased, it is treated with great difficulty. Modern surgical technique has so far advanced, however, that the infectious or inflammatory diseases of this portion of the auditory apparatus are now often amenable to successful surgical treatment. Life is thus saved, though the hearing is often left greatly impaired or altogether lost. The hearing would be impaired, however, by the inflammatory disease even though an operation were not performed.

Labyrinthitis (Inflammation of the Labyrinth); Infection of the Labyrinth; Caries or Necrosis of the Labyrinth; Suppurative Inflammation of the Labyrinth.—Very mild inflammation of the labyrinth is not attended by either suppuration, caries, or necrosis, but is characterized by more or less deafness and tinnitus (noises in the head), a loss of hearing for the higher tones of the musical scale, and a diminution or total loss of hearing by bone conduction when a vibrating tuning fork is placed upon the head.

The more severe infections of the labyrinth are attended by marked deafness, tinnitus, loss of hearing of high pitched tones and bone conduction, giddiness, nausea, vomiting, suppuration, caries and necrosis of the bone enveloping the membranous labyrinth. As the bony wall separating the labyrinth from the middle ear is the

thinnest and offers the least resistance to the infection and purulent secretion in suppurative or infectious labyrinthitis, it is often the seat of necrosis and perforation. This anatomical arrangement of the bony covering of the labyrinth is most fortunate, as it allows the purulent and infected secretion to drain into the middle ear, whence it escapes through the perforated drumhead into the external auditory canal. If this condition did not exist the infected secretion would more often penetrate the cranial cavity and produce meningitis and brain abscess.

The treatment of suppurative labyrinthitis consists in establishing free drainage of the purulent secretion into the middle ear. This is accomplished by first performing the radical mastoid operation, whereby the inner wall of the labyrinth (promontory) is exposed to surgical interference. The wall (promontory) is then removed and drainage is established. The technique of this operation is intricate and requires the skill of a trained and experienced aural surgeon.

Spongifying of the Bony Capsule of the Labyrinth.—This affection is characterized by an increasing porosity or spongification of the dense bone enclosing the membranous labyrinth, especially around the oval window, or inner drumhead of the ear, to which the stapes (stirrup-like ossicle) of the middle ear is attached. As a result of this pathological change in the bone surrounding the oval window the bone becomes distorted and bulges into the lumen of the oval window. The foot plate of the stapes, becomes fixed in its position (ankylosed), so that it cannot vibrate when sound waves are carried to it through the chain of ossicles (bones) in the middle ear. (See EAR, PHYSIOLOGY OF THE.)

The *cause* of this disease is obscure. It usually begins about the eighteenth year of life, and is more frequent in females, and is often transmitted from parent to child.

If, therefore, one of the parents is known to be affected by it the children should be carefully watched after the age of puberty for the first signs of deafness, and, if detected, placed under the observation and care of an otologist. It is only in the early stage of the disease that treatment is effective, and even then the results obtained are often quite disappointing.

The symptoms of the disease are deafness, tinnitus (noises in the head), loss of hearing for low pitched tones, prolonged hearing by bone conduction, and a normal Eustachian tube and drumhead. In other words all the symptoms of catarrhal middle ear disease are present, except the evidence obtained by examining the Eustachian tube and middle ear. While the bone enveloping the labyrinth is diseased the essential parts of the labyrinth are usually unaffected. The foot plate of the stapes is rigidly fixed in the oval window by the bulging spongified bone, and the function of the conduction apparatus of the middle ear is greatly impaired. This explains the apparent contradiction of a so-called labyrinthine disease being attended by symptoms of middle-ear disease.

Ménière's Disease (*Apoplexy of the labyrinth; Sudden hemorrhage of the labyrinth*).—This disease is due to a sudden hemorrhage into the labyrinth which instantly destroys the hearing. The destruction is so complete that it is extremely rare that the hearing is recovered.

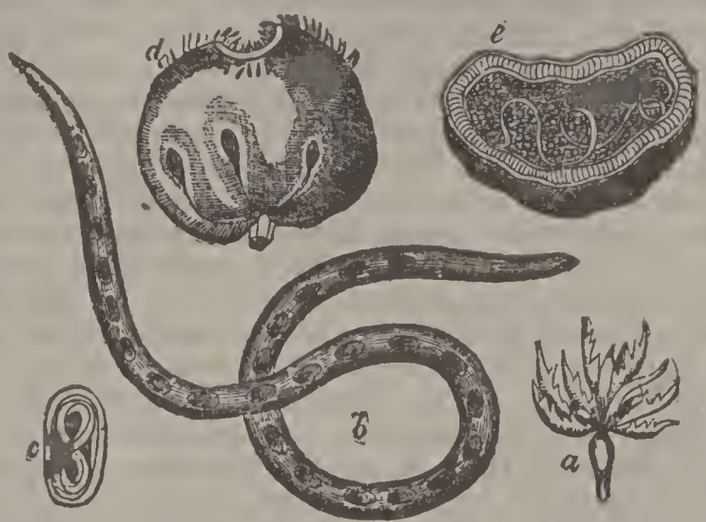
The *symptoms* of Ménière's disease (named after Ménière who first described it) are a sudden and complete loss of hearing in an ear previously unaffected, marked tinnitus, giddiness, nausea and vomiting lasting for from five to fourteen days. Treatment is usually ineffective though a few cases have been reported in which hearing was partially restored. The giddiness, nausea, and vomiting will disappear within two weeks without treatment. The patient should remain in bed during the persistence of these symptoms. If benefit is to be derived from treatment it should be instituted at once.

Another condition simulating Ménière's disease is known as *Ménière's symptom complex*. That is, many of the symptoms of apoplexy of the labyrinth are present, though the condition itself is absent. Ménière's symptom complex is due to a closure of the Eustachian tube and the consequent absorption of the oxygen from the air in the middle-ear cavity. The negative air pressure within the middle ear allows the drumhead to be pushed inward (retracted). The retracted drumhead forces the chain of ossicles inwards against the inner drumhead (oval window), thus compressing the fluid within the labyrinth. The pressure thus created interferes with function of the nervous apparatus of the labyrinth, and deafness, tinnitus, giddiness, nausea and vomiting occur. When the middle ear is inflated with air through the Eustachian tube all the symptoms immediately disappear. Such a result does not follow inflation in true Ménière's disease. The diagnosis is still further confirmed by the history of previous impairment of hearing.

Hemorrhage of the ear (a flow of blood from the external auditory canal) may be due to the presence of polypi or granulation tissue in the middle ear complicating suppurative otitis media, or it may be due to a fracture through the petrous or hard portion of the temporal bone. If the hemorrhage occurs in the course of a chronically discharging ear, and hearing by bone conduction is increased, aural polypi or granulations are probably present in the middle ear. As granulation tissue in a bony cavity is significant of dead or necrosed bone, hemorrhage from the ear may signify a serious and dangerous affection.

If the hemorrhage occurs immediately after an accident or blow upon the head, and hearing by bone conduction is impaired in the bleeding ear, the base of the skull is probably fractured through the portion of the temporal bone containing the labyrinth or nervous apparatus. In this condition the patient should be placed in bed and the external auditory canal sterilized by mopping it with a cotton-wound applicator or probe saturated with a 1–to–1000 solution of the bichloride of mercury (corrosive sublimate), after which the canal should be loosely packed with sterile gauze or cotton.

EAR-COCKLES, *ēr-kŏk'lz* (called also *Purples* and *Peppercorn*): disease in wheat, owing to the presence of *Anguillula tritici*, till of late known as *Vibrio tritici*. This is a small nematoid worm (see NEMATOIDEA: EELS, in Paste), yellowish-white, slender, and tapering toward the tail. Its minute eggs are supposed to be introduced into the sap of the wheat from infected seed, and so to find their way to the flowers, where they are hatched in the germen; the infected grains become dark green, then black, rounded like small pepper-corns, and furrowed on the surface; the glumes spread open, and the awns become twisted;



Ear-Cockles:

a, diseased wheat; *b*, the vibrio, greatly magnified; *c*, its egg, with embryo; *d*, diseased germen of wheat; *e*, section of diseased germen of wheat, greatly magnified, showing vibrios and their eggs.

the grains are filled with a white cottony substance, which at once dissolves in water, liberating the *Vibrio* in great numbers. Henslow calculates that 50,000 of the young *Vibrio* might exist in a grain of wheat. If the wheat is dried, the *Vibrio* becomes dormant, but retains its vitality in this state for six or seven years, and is ready to revive on the application of moisture.

EARD'LEY-WIL'MOT, SYDNEY MARROW, English rear admiral: b. East Sheen, Surrey, 1847, Oct. 3. He entered the navy in 1860, became lieutenant 1869, was promoted captain 1886, June 30, was retired in 1893, and became rear-admiral in 1903. He has published *Life of Vice Admiral Lord Lyons; Our Navy for a Thousand Years; Our Fleet To-day and its Development during the Last Half Century; Our Flags: Their Origin, Use and Traditions.*

EARL, n. *ėrl* [Icel. *iarl*, a prince, a viceroy: AS. *eorl*, a chief, a leader, a warrior]: in *Great Britain*, a nobleman third in rank, being above a viscount and below a marquis. EARL'DOM, n. *-dŭm*, the possessions or dignity of an earl *Note.*—It is curious that the word *earl*, so generally supposed pure Icelandic, should be found also in W. *arglwydd;* and Cornish, *arluth*, a lord; Gael. *iarfhlath*, pronounced *iarla*, a dependent chief—from *iar*, after; *flath*, lord.—The dis-

tinctive name of the noble among the northern races was *eorl*, or *jarl*, as opposed to the mere freeman, the *ceorl*, or *karl;* from which latter name come the modern German word *kerl*, and the Scotch word *carl*. From indicating the whole noble class, the title of eorl among the Anglo-Saxons, and perhaps generally among the Teutonic nations, came at first probably to be limited to those who were *ealdors*, or *ealdormen*, by office—that is to say, to those who were appointed to be at once governors and judges over a certain district, and to whom, according to Kemble (*Saxons in England*, II. 126), the titles of *dux princeps*, and *comes* are indiscriminately applied by the Latin writers, the same officer being called sometimes by one title, and sometimes by the others. Being thus limited to those who held the office of ealdors, the social not unnaturally came to be confounded with the official title, and hence the general error of tracing the word earl not to *eorl*, a noble, but to *ealdorman*, a title which Mr. Kemble prefers to translate by duke. The early relation between the duke and the count has been explained under the former title. In Europe generally, it was not till the count came to be recognized as a subordinate officer to the duke, governing a district of the province committed to the latter, that the earl assumed the position of the governor of a county, by the name of which he was commonly known. The title of duke, if it had existed, early disappeared in England, and was not revived till the time of Edward III. After the Norman Conquest, the French term count was substituted for earl; but it held its place only a very short time as the title of the officer, though it has continued ever since to give a name to the district (county) over which he presided, and a title to his wife. William the Conqueror, after the battle of Hastings, recompensed his chief captains by granting to them the lands and offices of the Saxon nobles; but by making the title of earl hereditary, he took, unintentionally perhaps, the first step toward changing it from a title of office to a title of dignity, and thus depriving it of substantial power. Deputies, *vice-comites*, or sheriffs, came necessarily to be appointed in all cases in which the earl was a minor, or otherwise incapacitated from discharging the duties of the office, till gradually the office itself passed to the deputy; the dignity alone, with the hereditary privilege of sitting as a legislator in the house of lords, remaining with the principal. The form of creation of an earl formerly was by the king girding on his sword, and placing his coronet on his head, and his mantle on his shoulders; but earls are now created by letters-patent; and it is not unusual for them to depart so far from the old notion of their being territorial officers, as to take as their titles their own names, with the prefix earl—e.g., Earl Grey, Earl Spencer, Earl Russell, etc. At present, the number of earls in Britain, including the peerages of Scotland and Ireland, exceeds 200. See PEER.

Earl's Coronet.

The EARL'S CORONET is a circle of gold, rising at intervals into eight pyramidal points, or spikes, on

the tops of which are placed as many pearls, and which alternate with strawberry-leaves: see CROWN.

EARL MAR'SHAL: office in England, of great antiquity, and formerly of importance. There is reason to believe that the marshal of England, afterward the earl marshal, was a distinct officer from the marshal of the king's house, but the point is not altogether clear, and there is consequently some difficulty in determining which of the offices was held by the Mareschals, Earls of Pembroke. For many generations, the office has been hereditary in the family of the Dukes of Norfolk, though the earls marshal having, to an unusual extent, had the fate to die either childless or without heirs-male, the line of descent has not been direct. The last grant is by King Charles II., and bears date 1762, Oct. 19, The earl marshal presided jointly with the constable over the court of chivalry (q.v.), the last proceedings of which are said to have taken place 1631. He is the head of the college of arms (q.v.), which has jurisdiction in descents and pedigrees; determines all rival claims to arms; and he grants armorial-bearings through the medium of the kings-of-arms, to parties not possessed of hereditary arms. The office of the lyon in Scotland is generally supposed to correspond to that of the earl marshal in England.

EARLE, *ėrl*, ALICE MORSE, American writer: b. Worcester, Mass,. 1853, April 27. She was married to Henry Earle in 1874. She has written extensively upon the manners and customs of the colonial period in New England and New York. Her published works are: *The Sabbath in Puritan New England* (1891), *Customs and Fashions in Old New England* (1893), *Life of Margaret Winthrop* (1894); *Diary of a Boston School Girl* (1894); *Costumes of Colonial Times* (1895); *Colonial Dames and Goodwives* (1895); *Old Narragansett* (1896); *Curious Punishments of Bygone Days* (1897); *Colonial Days in Old New York* (1897); *Home Life in Colonial Days* (1898); *Child Life in Colonial Days* (1899); *Stage Coach and Tavern Days* (1900); *Old Time Gardens; Sundials and Roses of Yesterday* (1903); *Two Centuries of Costumes in America* (1903).

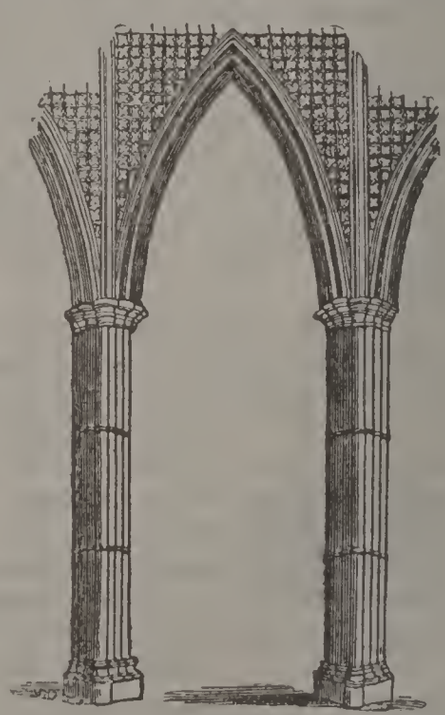
EARLE, MORTIMER LAMSON, American classical scholar: b. New York, 1864, Oct. 14; d. New York City, 1905, Sep. 26. He was educated at Columbia College; was instructor in Greek at Barnard College for six years beginning 1889, and was then appointed associate professor of Greek and Latin in Bryn Mawr College; 1898 to 1900 was lecturer in Greek at Columbia; and in 1900 was appointed professor of classical philology in Barnard College. Among other literary work he edited Euripides' *Alcestis* (1895), and Sophocles' *Œdipus Tyrannus* (1900).

EARLY, a. *ėr'lĭ* [AS. *ær*, before; *ærlice*, early; Icel. *athr*, before: comp. Gael. *ear*, east]: prior in season or time; coming soon; forward; before or in advance of others: AS. soon; betimes. EARLIER, a. *ėr'lĭ-ėr*, more early. EAR'LIEST, a. *-lĭ-ĕst*, most early. EAR'LINESS, n. the state of being early. EARLY-ENGLISH, n. in *philol.*, an

epithet most properly employed to designate the period 1250–1350, but commonly used to express any period between A.D. 1250 and the close of the 15th c.

EARLY, *ėrl'i*, JUBAL ANDERSON: 1816, Nov. 3—1894, Mar. 2: b. Franklin co., Va.: soldier. He graduated at the U. S. Milit. Acad. 1837, entered the army as a lieut. of artil., served through the Seminole war in Fla., 1837–8; resigned in the latter year, and studied and practiced law in Va. He was a maj. of Va. vols. during the Mexican war. At the opening of the civil war he was appointed a col. in the Confederate army; commanded a brigade at Bull Run and Williamsburg 1862; was promoted brig.gen. 1863; commanded a division at Fredericksburg and Gettysburg, and an army that invaded Md. and threatened Washington, 1864, July; sent a body of cavalry into Penn. which burned Chambersburg; was defeated by Gen. Sheridan near Winchester and at Fisher's Hill, Va., 1864, Sep., and at Cedar Creek Oct. 19; and was completely routed by Gen. Custer at Waynesboro, 1865, Mar., after which he was relieved of his command. He subsequently practiced law in Richmond and engaged with Gen. Beauregard in the management of a lottery in New Orleans. He became pres. of the Southern Hist. Soc., and published *A Memoir of the Last Year of the War for Independence in the Confederate States* (1867).

EARLY ENGLISH: general term for the form of Gothic in which the pointed arch was employed first in Britain. The E. E. succeeded the Norman toward the end of the 12th c., and merged into the Decorated (q.v.) at the end of the 13th. Its characteristics are beautiful and peculiar. Retaining much of the strength and solidity of the earlier style, it exhibited the graceful forms, without the redundancy of ornament which latterly degenerated into a fault in that which followed. Generally, it may be said to bear to the decorated something like the relation which an expanding rosebud bears to a full-blown rose. The windows are long and narrow, and when gathered in a group, are frequently surmounted by a large arch, which springs from the extreme molding of the window on each side. The space between this arch and the tops of the windows is often pierced with circles, or with trefoils or quatrefoils, which constituted the earliest form of tracery. Each window, however, is generally destitute of any tracery in itself. 'The moldings,' says Parker,



Early English Piers and Arch.

' in general consist of alternate rounds and deeply-cut hollows, with a small admixture of fillets, producing a strong effect of light and shadow.'—*Gloss. of Architecture.* From the same work we borrow the accompanying illustration of two very beautiful piers, surmounted by a lancet-shaped arch, and decorated in the manner peculiar to the style. They are from Westminster Abbey. Circular windows, however, still continued to be used, and trifoliated archways over doors, also are found, as at Salisbury Cathedral. By far the most characteristic feature of the style is the Tooth-ornament (q.v.), which is often used in great profusion. Where foliage is used, it is cut with great boldness, so as to throw deep shadows, and produce a very fine effect. The under-cutting is often so deep as to leave nothing to connect the leaves with the moldings but the stalks, and occasionally the edge or point of a leaf. The term Early English is said, by Parker, to have been introduced by Mr. Millers 1805. It corresponds to *Ogivale primitive* of French writers, and in Britain is often known as the first pointed or lancet-arched. See GOTHIC ARCHITECTURE.

EARN, v. *ėrn* [Dut. *arne,* harvest; *arnen,* to reap: Ger. *ernte,* harvest: Bav. *arnen,* to receive as a reward of labor: comp. Gael. *aran,* bread—from *ar,* to plow]: to gain or win by labor; to reap the fruit of one's labor; to merit or deserve. EARN'ING, imp. EARNED, pp. *ernd.* EARNINGS, n. plu. *ėrn'ingz,* that which is earned; wages; reward.—SYN. of 'earn': to acquire; obtain; gain; win; procure; attain.

EARN, n. *ėrn:* an eagle.

EARN, *ėrn:* river and loch in the s. of Perthshire, in the finely-wooded, beautiful valley of Strathearn, Scotland. —Loch E. lies n. of Ben Voirlich; its e. extremity is 24 m. w. of Perth. It is 7 m. long from e. to w., 1 m. broad, and 100 fathoms deep, and is surrounded by bold and rugged hills.—The river E. flows e. from the loch 40 m. through the strath, past Comrie, Crieff, and Bridge of Earn, into the estuary of the Tay, 7 m. s.e. of Perth. Along the river, near Abernethy, under a thick bed of clay, is a peat-bed 2 or 3 ft. thick, supposed continuation of the submarine forest at Flisk.—The Bridge of Earn, a much frequented village, stands on the right bank of the river, 6 m. s.s.w. of Perth, and near the saline springs of Pitcaithly.

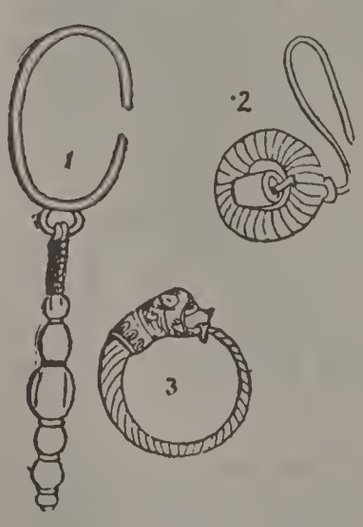
EARNEST, a. *ėrn'ėst* [Ger. *ernst;* Dut *ernsten,* to endeavor: AS. *georn,* desirous]: done with a will; with hearty endeavor to attain the end aimed at, eager to obtain; zealous; sincere; serious. EARN'ESTLY, ad. *-li.* EARN'ESTNESS, n. seriousness; solicitude; not a feigned appearance. IN EARNEST, not in jest; really intent on.—SYN. of 'earnest': ardent; eager; warm; importunate; animated; hearty; fervent.

EARNEST, n. *ėrn'ėst* [OF. *arres* or *ernes;* W. *ernes;* L. *arrha,* a deposit, a pledge]: money given in hand to assure a bargain; first-fruits; pledge; assurance; in *Scot.,* ARLES, n. plu. *ar'lz* [Gael. *earlas,* earnest-money—from *earal,* provision, caution (see ARLES)]: a small sum given in hand, or

a simple ceremony such as shaking hands, to assure the mutual consent necessary to a contract. In the first case, the E. is pecuniary; in the second, symbolical. It is not the E. but the consent, i.e., the agreement to a certain price, that is the root of the bargain; and the E. thus becomes a mere adminicle of evidence, which may be dispensed with even in cases in which it is exacted by custom, if the parties choose to preserve other evidence of the completion of their bargain. The contracts in which E. has been most frequently given are sale and service. In the case of sale, it usually consists of a small sum paid by the buyer, by the acceptance of which the seller is held to bind himself to the sale; in the case of service, it is a small sum given by the master, in accepting which the servant becomes bound to serve. The question as to whether the E. shall count as part of the price or wage depends on the intention of the parties, which, in the absence of direct evidence, will be inferred from the proportion which it bears to the whole sum. 'If a shilling be given,' as Mr. Erskine says, 'in the purchase of a ship or a box of diamonds, it is presumed to be given merely in evidence of the bargain, or, in the common way of speaking, is dead earnest; but if the sum be more considerable, it is reckoned up in the price.'—*Institutes,* b. iii. tit. iii. s. 5. The original view of E. in England was, that it was a payment of a small portion of the price or wage, in token of the conclusion of the contract (Story on *Sales*, p. 216); and as this view seems to have been adhered to, the sum, however small, would probably there be counted as a part payment.

EARNINGS: see under EARN.

EAR-RING: ring suspended from the ear which is bored for the purpose. This mode of adorning the person has always been favorite among Orientals. By Persians, Babylonians, Lydians, Libyans, and Carthaginians, ear-rings were worn by both sexes. In the classical nations of antiquity, their use was confined to women. In the *Iliad* (xiv. 182, 183), Juno is represented as adorning herself with ear-rings made with three drops resembling mulberries. From this period till the latest, the practice prevailed in Greece, and we find the ears of the Venus de Medici pierced for the reception of ear-rings. Pliny says (xi 50) that there was no part of dress on which greater expense was lavished among the Romans; and Seneca mentions an E. of which a drawing, copied in our illustration (fig. 1), is given in Smith's *Dictionary*, which he says was worth a patrimony. It has four pearls, two above and two below the precious stone in the centre. In the more valuable of the antique ear-rings,



Ancient Ear-rings.

pearls were almost always used; and they were valued for the completeness of their form as well as for their whiteness. In place of a ring, the ornament was often attached to the ear with a hook (see fig. 2), a custom which still prevails in Italy. Many Egyptian ear-rings of very beautiful design have been preserved of which fig. 3 is an example. These antique designs have been imitated in modern times, and if the use of an ornament which seems fit for a South Sea islander is to be continued, it can scarcely take a more graceful form than was often given to it by the ancients. See RING. During the reigns of Elizabeth and James I., ear-rings were worn in England by men; a custom still continued by many sailors. Master Matthew, in *Every Man in his Humor*, says to Brainworm: 'I will pawn this jewel in my ear;' and Hall, in his *Satires* (B. vi. Sat. 1), speaks of the 'ringed ear' of the new-come traveller; and many passages to like effect might be quoted. At present in western nations ear-rings are worn only by women. The ears are bored usually at about seven years of age. The boring, which produces a temporary inflammation, acts as a counter-irritant in cases of sore eyes; and this is sometimes given as a reason for putting rings in the ears.

EAR SHELL: see HALIOTIS.

EARTH, n. *érth* [Goth. *airtha;* Icel. *jord;* Ger. *erde;* AS. *eorthe*, earth: Gr. *erăzĕ*, to the ground]: mold; the mass of the globe; the ground; land; the world; its inhabitants; hole of a fox or of other vermin; a burrow; in *chem.*, a solid, opaque, friable substance, without lustre, and incombustible; in *Scrip.*, state of being carnal or temporary; V. to hide in the ground; to cover with mold; to burrow. EARTH'ING, imp. EARTHED, pp. *értht.* EARTHEN, a. *érth'n*, made of earth. EARTH'ENWARE, n. household utensils made of clay and hardened in the fire (see POTTERY). EARTH'LY, a. *-lĭ*, pertaining to this world; gross; possible or conceivable as things are on the earth. EARTH'LINESS, n. EARTH'LING, n. *-lĭng*, an inhabitant of the earth; a mortal. EARTH'Y, a. *-ĭ*, consisting of, resembling, or relating to, earth; in *Scrip.*, sensual. EARTH'INESS, n. *-nĕs*, quality of being earthy; grossness. EARTH'QUAKE, n. *-kwāk*, a shaking or trembling of the earth. EARTH-BATTERY, n. a large plate of zinc and a plate of copper, or a quantity of coke, buried at a certain distance asunder in damp earth. The moisture of the earth acts as the exciting fluid on this voltaic couple, and a feeble but constant current is produced. EARTH-BORN, earthly; human. EARTH-BORER, n. a form of auger for boring holes in the ground, where the strata are sufficiently soft and loose. The shaft has a screw-point and a cutting face. The twisted shank revolves inside a cylindrical case, which retains the earth till the tool is withdrawn. The valve opens to admit the earth, and closes as the tool is lifted. EARTH-GALL, n. in *bot.*, the Gentian tribe of plants, one characteristic of which is bitterness, especially *Erythræa Centaurium.* EARTH-LIGHT; same as EARTH-SHINE (q.v.). EARTH-NUT, a kind of tuber growing wild in the earth; the pignut; the tubers of *Bunĭ-*

ŭm bulbocas'tănum and *B. flexŭōsum*, ord. *Umbellif'ĕræ*. EARTH-PLATE, n. in *teleg.*, a plate buried in the earth, or a system of gas or water pipes utilized for the purpose, connected with the terminal or return wire at a station, so as to utilize the earth itself as a part of the circuit, instead of using two wires, as was the early practice. EARTH-PUFF, n. in *bot.*, species of Lycoperdon. EARTH-TABLE, n. in *arch.* the lowest course of stone visible in a building, level with the earth. EARTH-TONGUE, n. in *bot.*, a popular name given to the club-shaped fungi of the genus *Geoglossum*, of which word it is a literal translation. They are found on lawns and grassy pastures. EARTH-QUAKE-ALARM, n. an alarm founded on the discovery or supposition that a few seconds previous to the occurrence of an earthquake the magnet temporarily loses its power. To an armature is attached a weight, so that upon the magnet becoming paralyzed, the weight drops, and, striking a bell, gives the alarm. EARTH'S CRUST, the external rind or shell of our planet accessible to human investigation. BONE-EARTH, a phosphate of lime existing in bones after calcination. EARTH-FOAM, a fine light scaly variety of calcite or calcspar. EARTH SHINE, reflection from the moon to the earth of the light (originally from the sun) which the earth casts upon the moon; seen especially at the time of new moon, when sometimes the moon's whole surface is visible emitting an ashy light. EARTH-WORK, an embankment, cutting, or fortification made of earth. EARTH-WORM, a worm that lives in the ground; figuratively, a mean sordid creature. EARTH TO EARTH BURIAL, burial designed to aid in resolving a corpse as soon as possible into its constituent elements, instead of taking measures to impede its rapid decay. In 1875 this system was advocated by Seymour Haden. Discarding leaden and even wooden coffins, he advocated that wicker-work should be the material used. EARTHY CALAMINE, n. same as HYDROZINCITE. EARTHY COBALT, n. same as WAD. EARTHY FRACTURE, n. in *minerals*, a fracture exhibiting a rough surface, with minute elevations and depressions. EARTHY MANGANESE, n. same as BOG MANGANESE. *Note.*—In *chem.*, *the metals of the earths* are 'aluminum, indium, and gallium;' *the alkaline earths* are 'lime, strontia, and baryta.'—SYN. of 'earth, n.': country; soil; globe;—of 'earthly': grovelling; mean; sordid; base; vile; carnal; possible; conceivable.

EARTH, THE. The earth is the third planet in the solar system, counting from the sun, and its mean distance from that central body is 93,000,000 miles, or 91,406,000 miles in winter, and 94,524,000 miles in summer, to be more exact. It revolves in an almost circular course, around the sun, and from it obtains both light and heat.

Shape.—It is now so universally acknowledged that the earth is spherical in shape that it is with difficulty that we can believe that there was ever a time when intelligent men regarded it as flat. However, it can not be said to be perfectly round, for the slight flattening of the poles has made our planet a spheroid, rather than a true sphere.

At the same time this flattening effect is so slight—amounting to only 1-289 of the greatest diameter—that it seldom is taken into account, and could not be made perceptible to the human eye if its divergence was to be reproduced, in anything like a correct ratio, in a terrestrial globe. Its surface is flat, or so nearly so that it may well be called flat, for the inequalities due to its mountains and valleys are so utterly insignificant that they are scarcely worthy of consideration.

The fact that the earth is spherical in form has given scientists a valuable hint as to the history of its creation. In their opinion, it means that the elements that now constitute the earth were at one time in a fluid state. If left to itself such a mass would of necessity assume a spherical form, and, if a rotatory motion set in, the liquid mass would naturally flatten at the poles, and so become a spheroid. As a result, they claim the shape of the earth proclaims its history.

Size.—It is, of course, manifestly impossible for man actually to measure the earth's surface from the equator to the poles, but, from the investigations that have been conducted by the many scientific expeditions that have undertaken to measure a certain section of the earth's surface, and, from that, to estimate its size, we have been able to draw our conclusions upon this subject. Thus, we know that the length of the half-diameter at the equator is 3,962.5 miles, and, at the poles, 3,949 miles, or just 13½ miles less than the former. Thus, the flattening amounts to about 1-289 of the whole. The circumference at the equator is 24,856 miles, the length of a geographical mile being 2,024 yards. If these conclusions are correct, the surface of the earth comprises 197,000,000 sq. miles, while, in volume, it is 260,000,000,000 cubic miles. Enormous as these figures may seem, they become pitifully small when compared to the sun, which is no less than twelve hundred and fifty thousand times greater than the earth.

Density.—Science has estimated that the earth's mass is equal to 6,000,000,000,000,000,000,000 tons, a weight that is not only unnamable, but is incomparable with anything known to man, unless it be another world, or planet. Originally a fluid mass, probably composed of fiery matter, it was only by slow degrees that the surface hardened into a crust that was both solid enough and cool enough to become the home of organic life. The thickness of this crust, of course, it is impossible to determine. Our deepest descents into the earth have been less than 3,500 feet which is actually scarcely more than a step towards the centre. So far as we have any knowledge, therefore, either hypothesis of science may be correct. One maintains that the interior of the earth long ago became thoroughly coated and hardened. The other holds that the centre of the globe is still in a state of fiery fusion, and that this mass of fire is surrounded by a crust that varies in depth from 23 to 45 miles.

Movements.—If we should depend upon our own sense of vision, we should fall into the same mistake that ancient scientists made, and insist that the heavens revolve around the earth. In the olden times this was the accepted theory of science. Men saw the sun and stars appear in the east and disappear in the west, while the earth itself remained stationary, and they could not realize that all this was but an illusion of the senses; that the earth actually did move, and that the reason why they did not feel its motion was because they were so thoroughly a part of it.

The earth revolves upon its axis in one sidereal day, which is actually 3 minutes and 55.91 seconds less than the mean solar day. So far as ordinary observation is concerned this rotation continues practically unaltered, but, 'the searching investigations of modern times have shown that if absolute accuracy is insisted upon, the duration of the diurnal movement has undergone a slight change since the first days of astronomical observations. This slackening of speed has, within the last two thousand years, increased the duration of the day by the eighty-third part of a second' (Klein).

Besides this diurnal movement around its axis, the whole earth revolves about the sun in an ellipse in one sidereal year. This consists of 365 days, 6 hours, 9 minutes, and 9 seconds. It is by this movement that the unequal duration of day and night, and the change of seasons are effected. Thus, if the earth stood vertically upon the plane of the ecliptic, the sun would also stand immovably above the equator, in which case every spot upon the earth would have its own unchangeable climate, and day and night would always be of equal length.

To comprehend fully the exact nature of the earth's rotation and revolution it is necessary to have no more elaborate appliances than a common candle, an orange, and a knitting needle. See that the room is darkened, so that the light of the candle may represent the sun; let the orange take the place of the earth, and the knitting-needle, its axis. Thrust the needle through the orange, that it may spin upon it, and then carry it, still spinning upon the needle, about the light, but at a sufficient distance to give the lines of light and darkness an opportunity to play distinctly upon the orange. This, of course, only partially represents the phenomenon of night and day upon earth, but it still illustrates, if crudely, the manner in which the earth rotates upon its axis and revolves in its orbit. To make the illustration even more exact, the needle may be slanted about 23 degrees, and several rows of pins, inserted in the orange to represent the Arctic and Antarctic circles, the North and South poles and the equator, will add still more to the forcefulness of the picture. In other words, by carrying the orange around the light, with the point of the needle always held in the same direction, though sometimes toward the light, and, at other times, away from it, the

play of light and shade may be made to give a reasonably correct imitation of the two movements of the earth.

Surface Divisions.—The surface of the earth is composed of land and water, and these are surrounded on all sides by the atmosphere, or air. The land is subdivided into continents and islands; the water into oceans, seas, lakes, and rivers. Comparatively, the water area amounts to 144,150,300 sq. miles; the land area to 52,821,684 sq. miles. Of the water area, 125,272,000 sq. miles are occupied by oceans. Some 28,269,200 sq. miles, or more than one-half of the land area is fertile; 13,901,000 sq. miles are steppes, and 4,180,000 sq. miles, deserts. These estimates are made by Ravenstein, and they differ somewhat from those presented by other authorities. Using these as a basis of calculation, however, it is found that 39,656,-316 sq. miles of land are contained in the continents, and 11,582,684 sq. miles in islands. Of the continents, Asia is the largest, having 14,710,000 sq. miles; Africa stands second, with 11,514,000 sq. miles, and the others follow, according to their respective size: South America, 6,837,-000 sq. miles; North America, 6,446,000 sq. miles; Europe, 3,555,000 sq. miles, and Australasia, 3,288,000 sq. miles. About 4,888,600 sq. miles are embraced in the polar regions.

According to the best authorities, the volume of all the land collectively, above the level of the sea, is, in round numbers, 12,757,500 cubic miles. If we consider that the surface measure of the sea is 137,700,000 sq. miles, and its average depth, as Krummel has estimated, 3,684 yards, its cubic measure would be no less than 285,950,250 cubic miles. In other words, while the surface of the land compares with that of the sea in a ratio of 1 to $2\frac{3}{4}$, in volume the proportion of land and water is as 1 to 22. While it is true, therefore, that 22 times the bulk of the continents, as they appear at the surface of the earth could be put into the space occupied by the water, the comparison is scarcely a just one, as the lands, instead of lying flat along the surface of the water, descend far below it. To compare the two, it is necessary that this fact should be taken into consideration, and, as Klein has said, as it is clear that the average height of the land's supports must equal the average depth of the sea, it may easily be estimated that the whole volume of the land below the surface of the sea amounts to at least 121,050,-062, which makes the proportion of the volume of land and sea as 1 to $2\frac{2}{5}$. While it is impossible to show that these figures are any more than estimates, it is probably safe to say that Klein is approximately correct in his conclusion that the proportionate volume of sea and land is practically the same as that of their surface.

Formation of Lands.—Although there is every evidence to show that the concentration of land into compact masses of great size is one of the great general laws that governed the earth's formation, science is unable positively to determine the cause that drove it upward from the ocean bed.

It is claimed, of course, that this effect was the direct result of the process by which the globe gradually cooled and formed the crust that is now its surface, and that the elevations and depressions that we now know as mountains and valleys are formations that would naturally follow these ages of contraction.

While the general outlines of the continents that were formed at this time have since remained about the same, this does not imply that there have not been many subsequent upheavals and divisions. It is only necessary to examine the clearly outlined evidences of geology to prove conclusively that there have been some great changes in the horizontal as well as in the vertical distribution of the mainland, for it is impossible to deny the fact that the waves of the sea once rolled where dry land now exists, and that what were once wide stretches of land are now beneath the sea.

There can be no doubt, in fact, that there have been many changes in the form of the earth since those early ages of which geology alone has the record. It has been thought, adds Klein, that the solid land has gained in extent since the tertiary period, by stretching out to the north, and west, while, in the south and east, of the present dry land, lie large spaces of lost continents. The idea receives some support by the great number of islands found along the southeast side of the continents, when compared with the north and western sides.'

The islands of the earth are divided into two great groups, the Coast, and the Oceanic islands. Klein also divides the Coast islands into three general groups:

1. Islands recently separated from the mainland, and having the same forms of organic life as the adjoining continent; not distinguished by the exclusive possession of special organic forms in process of degeneration. Examples: the British Isles, Tasmania, and Japan.

2. Islands separated from the mainland in prehistoric ages. Their animal and vegetable life already show divergence from that of the mother continent. If the separation took place at a very remote geological period, there may be even differences of type. Examples: Antilles, New Guinea.

3. Island groups, rich in native species, with an appearance of antiquity. Australia with reference to South Asia; Madagascar, Ceylon, and, perhaps, New Zealand. (Land, Sea, and Sky.)

Oceanic islands are those that have no direct relationship to the continents. These he also divides into three groups:

1. The young, low islands built of coral, poor in all forms of organic life, especially in reptiles and mammalia; distinguished by no exclusive possession of special animals or plants. Examples: the Atolls of the Pacific Ocean, which are best represented by the Kerguelen Islands.

2. The recently formed islands created by volcanic action; richer in forms of life than the low Atolls, but without special forms. Examples: northern group of the Marianas, St. Paul, and New Amsterdam.

3. Old island-volcanoes, richer than the preceding, with their own types of plants and animals, asylums of refuge of extinct continental species. Examples: Madeira, Ascension, St. Helena, Bourbon, Mauritius, the Galapagos, etc.

The islands included in the first group are known as 'low' islands; those included in the second and third groups, as high oceanic islands.

The Atmosphere.—The air, or gaseous atmosphere that surrounds the earth on all sides, is composed of about 21 parts oxygen and about 79 parts nitrogen. There is also a very slight admixture of carbonic acid, and a changing quantity of aqueous vapor. In the matter of density, the air decreases from below upward, until its rarity becomes so great that it escapes our observation. According to Klein's observations, on the level of the sea, in 45 degrees of latitude, and with the barometer standing at 29.94 inches the density of the air is 1/10517 that of quicksilver. Two miles above the sea level, its density is only 3/5 of what it was on the sea level; at a height of 8 miles, only 1/6; at 12 miles only 1/14; at 16 miles, 1†33; at 20 miles, 2/1000; at 32 miles 1/1000; and at 40 miles, only 1/6000. As at the level of the sea the weight of a column of quicksilver 29.94 inches high is balanced by the weight of a column of air as high as the air goes. Therefore a column of air from the lowest to the highest strata is as heavy as a column of quicksilver of equal base and 29.94 inches high; and the collective weight of the atmosphere is as great as an ocean of quicksilver covering the whole surface of the earth to 29.94 inches in height. This weight amounts to 5,500 billions of tons.

Contrary to the evidences of our senses, air is anything but transparent. In fact, in the lower atmospheric strata its transparency is extremely variable. Thus, the sun's light passing vertically through the air loses 1/15 of its brightness; when it is on the horizon, its light is only 1/60 of what it would be if it did not have to pass through the atmosphere. It is to the optical phenomena of light in the earth's atmosphere that we owe the general daylight, the blue color of the sky, the gorgeous hues that so often distinguish the sunrise and sunset, the tremulous flickering of the stars, the colored rings around the sun, etc. Thus, Tyndall's experiments have proved that an absolutely pure atmosphere would be so thoroughly transparent that the light rays would pass through it without becoming visible to the eye. To the sun's rays the atmosphere would then be as a vacuum, and, at the exact moment the sun set, the earth would become as dark as at midnight.

The pressure exerted by the atmosphere, by reason of its weight and elasticity, may be measured by the barometer. As the pressure increases, the quicksilver rises in the tube of the barometer; as the pressure decreases, the quicksilver falls. At the surface of the sea the pressure is about 29.94 inches, but it steadily decreases as the height above the sea level increases. At a height of 6,000 feet, it is reduced by about one-half, while, at 32 miles above the

sea, the pressure of the atmosphere became so light that the barometer would stand at .04 inch. It is with the aid of the barometer, therefore, that the measurements of altitudes are made. It has, thus, been of the greatest importance in the investigation of the physical construction of the earth.

The flow of air from the point of greatest pressure to that of slightest pressure produces the condition that we know as wind. The phenomena that we know as rain, hail, snow, mist, etc., are also due to water existing in the air in the form of invisible vapor, which is communicated to it by the continuous processes of the evaporation of the waters of the globe.

Organic Life.—It is probably true that the structure of the globe is a great book in which mankind may read its history from the day of creation, if he can but learn how to read deeply enough to interpret the record that has been prepared for him. Thus, if, from its shape, we are to believe that it was once a ball of heated gas, and then a ball of liquid fire, and that, in the process of cooling down, a deep crust was finally formed around the globe, it is only reasonable to suppose that the various strata contain the record of the earth's history.

The oldest rocks that have been examined in the earth's crust, contain no organic remains, unless, as has been stated by some good authorities, the graphite contained in crystalline slates is actually the last remains of the earliest vegetable life. From that stratum, however, as we ascend towards the present surface of the earth, we find the fossil remains of the vegetables and animals that have existed since the earth was formed. As we proceed we find the floras and faunas continually changing in form, but so gradually that it is frequently difficult for scientists to assign them to distinct periods. In the lowest strata are forms of types that are now absolutely extinct, while in the latest, or highest strata, nearly all are living forms.

According to the opinion of science, the first living forms were those mysterious creatures known to us as protozoa, and they are used as a starting point from which to trace the development of all organic formation.

It is from this beginning, therefore, that the earth has developed into a great garden, from which we may derive not only beautiful plants to adorn our surroundings, but many other things that we need; fruits and grains for our food; wood for our warmth and shelter; material for our clothing; medicine to cure our ills, and substances that we may use in many of our arts. In the cultivation of this garden, in fact, man devised and developed his first art and industry, agriculture, for it was the discovery of the possibility of increasing the resources of vegetation by cultivation that provided him with his first useful occupation.

It is from this beginning, too, that the earth has become the home of the present countless species and varieties of animal life. They are both large and small, and are dis-

tributed over nearly all portions of the globe, and in all its waters. Some of the largest have disappeared. Our knowledge concerning the smaller species is more limited, but some of the small types that still exist are so tiny that it is impossible to discern them without the aid of a microscope. Many of these animals have been trained to do man's service; while others still provide him with his most nourishing food.

Geographers have divided the earth into five zones: one tropical, two temperate, and two frigid zones. In relation to vegetation, however, each hemisphere is divided into eight zones. According to Myer's system they are as follows:

1. Northern Polar Zone.—Extends from 90° to 70° N. lat. Animals, shrubs, and trees are altogether wanting. The only vegetation consists of small hardy plants, a few inches in length, with creeping roots, and large blossoms.

2. Northern Arctic Zone.—Lat. 72°, to the northern Arctic circle. Shrub-like plants exist. The limit of tree growth generally falls within this zone.

3. Northern Sub-Arctic Zone.—From the Arctic circle 66° 32′ to 58° N. lat. This division has practically no strongly marked characteristics of its own, but has rightly been termed a 'transition zone,' in which the Arctic flora exists side by side with that of more temperate climates. Prevalence of coniferæ.

4. Northern Cold Temperate Zone.—From 58° to 45° N. lat. The special characteristics of this zone are tracts of deciduous-leaved forest trees, meadows, heaths, moors, and steppes. On the northern limit the beech is seen, and corn is cultivated.

5. Northern Warm Temperate Zone.—From 45° to 34° N. lat. Trees and shrubs, with stiff, shining, evergreen leaves, and plants armed with thorns and prickles appear.

6. Northern Sub-Tropical Zone.—From 34° to tropic of Cancer. A second 'transition zone.' Cotton, coffee, tea, rice, and maize are grown.

7. Northern Tropical Zone.—From the tropic of Cancer to 15° N. lat. Equatorial produce of all kinds, including sugar-cane, bananas, yams, maniocs, indigo, rice, and maize. In this zone plant life depends no longer upon temperature, but upon the distribution of moisture, which produces in one place deserts, and in another impenetrable forests.

8. Equatorial Zone.—From 15° N. to 15° S. lat. In this zone vegetation reaches its highest development.

The southern zones correspond to those of the northern latitudes, except for slight variations. For example, the Southern Polar Zone is scarcely worth including in the list, as all vegetation ceases below 65° S. lat.

In addition to this table of zones, well marked variations exist in vegetable life as one ascends from a tropical valley to the snow-crowned top of a mountain. In regard to this Klein says that 'in ascending from the level of the sea, we pass through the eight regions of palms and

banana; of tree, fern, and figs; of myrtle and laurel; of evergreens; of deciduous-leaved trees; of coniferae; of Alpine roses, and, lastly, of those mountain plants which struggle for existence along the limit of perpetual snow.'

In this regard, the following table, prepared by Schlagintweit, is instructive:

Upper Limit of Growth.	Northern Alps.	Central Alps.	Groups of Mont Rosa and Mont Blanc.
	Yards.	*Yards.*	*Yards.*
Vine	470	565	865
Walnut	790	850	1,030
Beech	1,325	1,220	1,500
Corn	845	1,255	1,475
Trees, coniferæ	1,725	1,880	2,035

The zoological regions devised by science coincide neither with the botanical zones nor with the political divisions of the earth. Of these regions there are six, each of which is divided into four subdivisions. There is no Arctic region represented, as there is in the case of the flora, because the number of Arctic mammals and birds is too small for separate enumeration. Accordingly, the entire polar region is tabulated together. The following table is that prepared by Wallace:

The Zoological Regions.

Region.	Vertebrata.		Mammals.			Birds.		
	Families.	Special Families.	Genera.	Special Genera.	Percentage.	Genera.	Special Genera.	Percentage.
Palaearctic	136	03	100	35	35	174	57	33
Ethiopian	174	22	140	90	64	294	179	60
Oriental	164	12	188	55	46	340	165	48
Australian	141	30	72	44	61	298	189	64
Neotropical	168	44	130	103	79	683	576	86
Nearctic	122	12	74	24	32	169	52	31

EARTH-CLOSET: see Sewage Earth-closet.

EARTH HOUSES, or Eird-houses, *yĭrd-*, or Yird-houses, *yĕrd-:* name in Scotland for the underground buildings, which in some places are called also 'Picts' Houses' (q.v.), and in others, it appears, 'Weems,' or caves. Martin, in his *Description of the Western Islands*

(1703), when their use seems to have been still remembered, speaks of them as 'little stone-houses, built under ground, called earth-houses, which served to hide a few people and their goods in time of war.' The earth-house, in its simplest form, is a single irregularly-shaped chamber, four to ten ft. in width, 20 to 60 ft. in length, and four to seven ft. in height, built of unhewn and uncemented stones, roofed by unhewn flags, and entered from near the top by a rude doorway, so low and narrow that only one man could slide down through it at a time. When the chamber is unusually wide, the side-walls converge, one stone overlapping another, until the space at the top can be spanned by stones of four or five ft. in length. In its more advanced form, the earth-house shows two or more chambers, communicating with one another by a narrow passage. There are instances in which one of the chambers has the circular shape and dome-roof to which archæologists have given the name of the 'BEEHIVE-HOUSE' (q.v.). Occasionally, as many as 40 or 50 earth-houses are found in the same spot, as in the moor of Clova, not far from Kildrummy, in Aberdeenshire. They appear to have been built almost invariably in dry places, such as gravelly knolls, steep banks of rivers, and hill sides. They are generally so near the surface of the ground, that the plow strikes upon the flagstones of the roof, and thus leads to their discovery. The object most frequently found in them is a stone quern, or hand-mill, not differing from that which continued to be used in remote corners of Scotland within the memory of living men. With the quern are generally found ashes, bones, and deers' horns; and more rarely small round plates of stone or slate, earthen vessels, cups and implements of bone, stone celts, bronze swords, gold rings, and the like. Occasionally, the surface of the ground beside the earth-house shows vestiges of what are supposed to have been rude dwelling-houses, and folds or inclosures for cattle. This, with other things, may indicate that the earth-houses of Scotland and Ireland (for they are found in that island also) were put to the same purpose as the caves which, as Tacitus (writing in the 2d c.) tells us, the Germans of his day dug in the earth, as storehouses for their corn, and as places of retreat for themselves during winter, or in time of war.

EARTH-NUT: popular name of the tubers of certain umbelliferous plants, particularly *Bunium bulbocastanum* and *B. flexuosum*, common in most parts of Europe. Names of the same signification are given to them in a number of European languages. *Arnut*, *Yernut*, and *Jurnut*, Scotch and English provincial names, are corruptions of earth-nut. PIG-NUT is another common English name, pigs being very fond of these tubers, grubbing up the ground in quest of them, and soon becoming fat upon them. They are called also *earth-chestnut*, from their resemblance in taste and qualities to chestnuts, perhaps also from their resemblance in size, and their being black or very dark brown externally, and white within.

EARTHQUAKE.

EARTHQUAKE: any tremor or shaking of the solid crust of the earth. The frequent occurrence of earthquakes, their destruction of life and property, their influence upon the solid surface of the earth, and the mysteriousness of their cause, force them upon man's attention It is estimated that 12 or 13 earthquakes, destructive more or less of life and property, occur every year. Indeed, the earth is never free from tremors, as indicated by delicate instruments, which also reveal the fact that in even violent shocks the actual movement of the ground is surprisingly small, and, moreover, is often in directions so complicated that different persons give conflicting reports. In the most destructive shocks whole cities and districts have been laid waste; and enormous masses of human beings have lost their lives. No less than 60,000 perished in the great Lisbon earthquake, 1755; and in that of Calabria, in the end of last c., 40,000 were destroyed. It is estimated that as many as 13,000,000 of the human race have thus perished The great changes which earthquakes produce on the earth's surface disclose to the geologist an agency which seems to have been at work during every period of the earth's history, and which has altered the earth's surface to an extent that can scarcely be imagined. The observed results of earthquakes which more immediately demand his attention are such as these: the new lakes and river courses which they form, at the same time obliterating the old ones; the new valleys due to subsidences; the fissures of various sizes that they form; and the immense landslips that they frequently produce. Also the mysterious nature of the producing cause of earthquakes is a strong incentive to their study. It is unfortunately true, that the most popular scientific inquiries are those in which the imagination has large play: dry inductions from observed phenomena are not suited to the genius of popular modern science. Consequently, earthquakes, where every attempt at explaining their origin is theoretical, from the impossibility of obtaining direct observation, affording as they do a wide field for the play of the poetic faculty, find numerous students.

No portion of the earth's surface is exempt from the influence of earthquakes Egypt has been less visited than perhaps any other country, but even there we have the record of one which took place 1740; Holland also with its loose alluvial deposits, has felt their power. Nor is the bed of the ocean exempt; records of many subaqueous earthquakes exist, taken by vessels at sea, sometimes passing over the point of greatest disturbance at the moment of the shock. In like manner earthquakes have been active at every period of the earth's existence, breaking up its solid crust, elevating or depressing its surface, and doing as much as any other single agent to bring it into its present condition. They have been probably at some periods more active than at others, as we find that some districts are now more liable than others to their visitation. So well defined, indeed, are the localities where earthquakes occur, that it is easy to exhibit their limits on a map. They are most

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1. Ruins Along the Sea Front at Messina, the American Consulate in Foreground.
2. Soldiers Searching the Ruins for Bodies.

frequent around the present lines or centres of volcanic action (see VOLCANO); and their frequency and violence seem to bear some relation to the activity and intensity of the associated volcanoes. Observers of volcanic phenomena have noticed that every great eruption, in whatever part of the world observed, and whether from a volcanic vent on land or beneath the ocean, is accompanied by earthquake shocks of greater or less violence and duration; while, on the other hand, those observing earthquakes speak of them as accompanied by volcanic eruptions, and of their often ceasing on the opening of volcanic vents. It is, however, an important fact that, though regions of active volcanic action are those of most frequent earthquake movements, yet the most violent earthquakes do not appear to have occurred in these regions, but, on the contrary, in districts lying some degrees away from the nearest volcanic action, as, for instance, in the famous earthquake of Lisbon. Districts in which there are extinct volcanoes are not more liable to such visitations than non-volcanic regions.

The phenomena connected with earthquakes have been variously described. Many writers refer to appearances in the heavens, or changes in the atmosphere, which to them seem to have some connection with the earthquake. They tell of irregularities in the seasons preceding or following the shock, of sudden gusts of wind interrupted by sudden calms, of violent rains at unusual seasons, or in countries where such phenomena are almost unknown, of a reddening of the sun's disk, of a haziness of the air often continued for months, and similar phenomena. But these are so irregular in their appearance, and have been so seldom observed associated with more than a single earthquake, that, in the absence of any decided reason to the contrary, there seem no grounds for believing that they have real connection with the earthquake. It is different with underground noises, which frequently precede, accompany, or succeed the occurrence of earthquakes, or some of the shocks of them. They are undoubtedly intimately connected with the shock, yet earthquakes occur, even of the greatest violence, unaccompanied by any sound whatever. Different descriptions have been given of these subterranean noises. In some earthquakes, they are likened to chains pulled about, increasing to thunder; in others, the sound is like the rumbling of carriages, growing gradually louder, until it equals the loudest artillery; or like heavy wagons running away upon a road; or distant thunder; or like the hissing produced by the quenching of masses of red-hot iron in water; or like the rush of wind underground. As there have been earthquakes without subterranean noises, so there are frequently, in S. America and elsewhere, underground sounds not followed by earthquakes.

The more intimate earthquake-phenomena are more uniform. Sometimes there is nothing else felt than a trembling or gentle motion of the surface, without producing any injury. In severe earthquakes, the almost invariable succession of phenomena is first a trembling, then a severe

shock, or a succession of shocks, and then a trembling, gradually becoming insensible. The violent shocks are instantaneous, and very few in number, sometimes only one, usually not more than three or four. In the intervals between these, smaller shocks or tremblings take place. The severe shocks do the mischief. At the point or line of greatest disturbance, the shock has a distinctly vertical direction, coming from below upward. As we leave this point, the direction of the motion becomes more and more horizontal, gradually also decreasing in intensity until it becomes insensible. This progressive movement is produced by an earth-wave or true undulation of the solid crust of the earth. The whole mass of the area is not moved at once, but only the wave-crest. In the earthquake, 1870, Oct. 19, including area between Quebec, St. John, N. B., New York, and Chicago, the velocity of the wave was estimated 14,000 ft. per second In 1886, Aug. 31, a shock included 20 states. In the case of the earthquake at Lisbon, the progress of the wave was roughly calculated; it was shown to have had very great velocity, and to have lasted only for an instant at any one spot. The area affected on this occasion was very extensive. The shock was felt on one side as far as the s. shores of Finland, and on the other it reached beyond the St. Lawrence in Canada, occasioning high waves in the harbors of New York and Boston, and was observed in some of the W. India Islands—an area of no less than 7,500,000 sq. miles. The force required to move this must have been enormous, for, suppose the thickness of the earth's crust moved to have been no more than 20 m., then 150,000,000 cubic m. of solid matter was moved. The influence of such an earthwave is communicated to the sea, when the earthquake is near the shore, or on the bed of the ocean. The sea swells, and slightly retires from the beach, and then a great wave rolls in upon the shore. At the Lisbon earthquake, this wave rose to a neight of 60 ft. at Cadiz. It carries with it sea-spoil, scattering it over the surface of the earth.

In 1906, April 18, Professor T. J. J. See, the distinguished astronomer, observed the great earthquake which destroyed San Francisco, and being dissatisfied with the causes usually assigned for earthquakes, entered upon a general investigation of the physical basis of these terrible disturbances of the earth's crust. He soon found that a common cause underlies all earthquakes and volcanoes, and developed a new theory of mountain formation, and many other phenomena connected with the physics of the earth. He proved that leakage of water, chiefly under the great pressure in the ocean beds, leads to the formation of steam in, or just under, the heated rocks of the earth's crust, which at intervals explodes towards the land, pushing up the mountains along the sea coast, and causing some of them to break out into volcanoes. It

is observed that volcanoes follow the sea-shore, or form in the sea, never far within the continents, and moreover nearly all the vapor which they emit is steam, which confirms the theory. All earthquakes are due to steam forming in the molten rock beneath the earth's crust. Thus he explains the elevation of mountains, plateaus, and islands; also the feeble attraction of mountains long since noticed in Geodesy. These elevated portions of the earth's crust are underlaid with pumice, or steam-saturated lava. When much lava has been expelled from under the sea, the support of the crust is thereby weakened, and at intervals gives down. The subsidence of the sea-bottom after an earthquake causes those great (so called 'Tidal') waves, which are even more dreaded than the earthquakes themselves.

When Davy discovered the metallic bases of the earths and alkalies, he threw out the idea that those metals might abound in an unoxidized state in the subterranean regions, to which water must occasionally penetrate. When this occurred gaseous matter would be set free, sufficient to produce the earthquake, the metals would combine with the oxygen of the water, and heat enough would be evolved to melt the surrounding rocks.

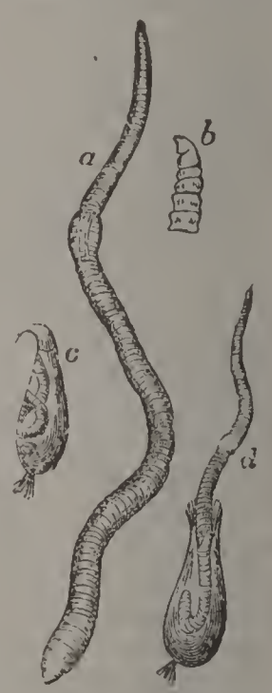
The old assumption that the earth consists of a molten fluid core with a cooled and hardened rind floating upon it, is now generally deemed inconsistent with the rigidity that astronomers have proved the earth to possess. But though the earth must be mainly solid, it is yet believed to be of a honey-combed structure, and that the cavities contain in many places lakes of molten rock, between which and the surface volcanoes are orifices of communication. Into these cavities, water sinking down through crevices from the ocean or the land must be constantly finding its way; and the steam thus generated exerts such enormous pressure as to force the molten matter to the surface, itself mingling and escaping with it. A later doctrine is that all sedimentary deposits contain enough water to supply steam for earthquake explosions, when the deposits subside to regions of intense heat; so that water from the ocean is not needed.

EARTHS, in Chemistry: a general term for the oxides of a considerable number of metals; they do not dissolve appreciably in water and so fail to give an alkaline reaction, they are reduced to the metals with considerable difficulty, and most of them occur in comparatively small quantities, hence these are sometimes called the *rare earths*. This class includes the oxides of scandium, terbium, samarium, etc. The *earths proper*, which are not so rare, include the oxides of aluminium, glucinum, cerium and thorium, the last two of which constitute the ordinary incandescent gas mantles. For the *Alkaline Earths*, see ALKALIES.

EARTH WORKS, in Fortification: general name for all military constructions, whether for attack or defense, in

which the material employed is chiefly earth. The word *earthwork,* however, has lately received new importance, in reference to a discussion among military engineers whether earthwork defenses generally are better or worse than those of masonry. The fracture of the Russian granite fortifications at Bomarsund, and, on the other hand, the obstinate defense made within the earthen defenses at Sebastopol, led many writers, about 1855, to express a preference for earthworks instead of stoneworks. Mr. J. Fergusson (*Portsmouth Protected,* 1856) especially advocated this view. The reasons urged are—that masses of earth can be more quickly and cheaply put up than masses of masonry; that in most places earth is more readily obtained than stone; that if an earthwork be knocked to ruin by balls and shells, it can be repaired in a very short time; and that the defenders are not exposed to so much injury as in masonry-works, where splinters of stone fly about in a perilous way. The late Sir John Burgoyne, leading military engineer in England of his day, combated these views. He contended, among other things, that as a given amount of cannonading will make a much larger breach in earthwork than in stonework, the latter is best fitted to prevent capture by assault. He insisted that earthworks should be regarded rather as temporary expedients than as purposed and permanent constructions; and he claimed the authority of continental engineers in support of this opinion. See further under FORTIFICATION.

EARTH'WORM (*Lumbricus*): genus of *Annelida* (q.v.), of sub-order *Oligochæta.* There are many species, all closely resembling in characters and habits the common E. or Dew-worm (*L. terrestris*), everywhere in the arable United States. It has no head distinct from the body, no eyes, no antennæ, nor any organs external to the rings of which its body is composed, except minute bristles pointing backward, of which each ring bears four pair, and which are of use in its locomotion. It sometimes attains nearly a foot in length, and more than 120 rings have been counted in its body. The end at which the mouth is situated is pointed, and the tail is flattened, while the general form is cylindrical. The mouth consists merely of two lips, the upper lip elongated; there are no teeth nor tentacles, and the worm subsists by swallowing fine particles of the soil, from which its digestive organs extract the digestible matter, the rest being voided often in little intestine shaped heaps, called *worm-casts,* on the surface of the ground. The locomotion of



Earthworm (*Lumbricus terrestris*):
a, earthworm; *b*, anterior extremity, showing the mouth (the bristles are also shown); *c*, egg, containing two young; *d*, young escaping from the egg.

the E. is effected by means of two sets of muscles, which enable it to contract and dilate its rings, its bristles preventing motion backward, and the whole muscular effort thus resulting in progress; while the expansion of the rings, as it contracts the anterior segments, and draws forward the hinder parts, widens a passage for it through earth whose particles were close together before. Earthworms are thus of very great use, their multitudes continually stirring and loosening the soil through which they work their way; and moles, pursuing them to feed on them, stir and loosen it still more; while worm casts gradually accumulate on the surface to form a layer of the very finest soil, to which it is supposed that the best old pastures in a great measure owe their high value.

Earthworms do not often visit the surface of the ground, except during night, and when the ground is moist. In the evening, during or after rain, or in the morning when the dew is abundant, they may sometimes be seen travelling about in great numbers. Both drought and cold cause them to retreat more deeply into the earth.—Their respiration is effected by means of little sacs, which communicate by minute pores with the external air. They are hermaphrodite, but mutual fecundation takes place by means of the thickened knot (*clitellum*) which is situated in front of the middle of their body. Their eggs often contain two embryos, and the young worms escape by a sort of valvular opening at the end.

Besides their usefulness in the improvement of the soil, earthworms are of importance as food for birds, fishes, etc. They are much sought as bait for fishes. The instinct which prompts them to hasten to the surface when, in quest of bait, the angler shakes the soil with a spade or fork, is perhaps to be referred to the similar shaking on the approach of their constant enemy, the mole.

An E. of great size is common in the E. Indies, wherever the climate is moist, from the Himalaya to Ceylon and Java. It is *Ichyophis glutinosus*. Much interesting light was thrown on earthworms in Mr. Darwin's work, *The Formation of Vegetable Mold through the Action of Worms* (1881).

EAR'-TRUMPET: contrivance for improving the hearing of the partially deaf. For this purpose, many ingenious instruments have been devised. The principle in them all is the same: to collect the sonorous vibrations, and to convey them in intensified form to the deeper parts of the ear. In this way, the hand placed behind the external ear constitutes the simplest form of ear-trumpet. Ear-trumpets should not be used indiscriminately, for in unsuitable cases they often do much mischief, both by increasing the deafness, and aggravating the noises in the head from which deaf persons often suffer so much. They are of most use, perhaps, in advanced cases of nervous deafness, though injurious in the early stages of this complaint; they are hurtful also in all acute diseases of the organ, and of little or no use in those cases of great thickening of the contents of the middle ear, where the adapting power of the organ

has been lost. There are many varieties of E. T. in common use. The most useful and comfortable are those worn on the head, which are termed ear-cornets or acoustic auricles. They can be concealed under the hair or cap, and may be adapted to one or both ears by means of a spring over the head. The apparatus commonly in use requires to be held in the hand, and consists of a narrow portion inserted into the ear-passage, and which gradually expands into a wide mouth; or the extremity of the instrument may be turned downward, as in the form which has been named Miss Martineau's trumpet. Another variety, applicable to the more severe cases of deafness, consists of an elastic tube, one end of which is tipped with ivory, and is placed in the ear of the patient; the other is held in the hand of the speaker, who applies his mouth to the open extremity. With this instrument, only one voice can be heard at a time. With the first-mentioned variety, general conversation can be heard often quite well. Ear-trumpets are generally made of some thin metallic substance, such as tin. Gutta-percha, vulcanite, and other substances, also are frequently used.

EAR'WIG (*Forficula*): genus of orthopterous insects recently subdivided into a number of genera, and forming the family *Forficulidæ*, which many entomologists constitute into a distinct order, *Dermaptera* [Gr. leather-winged].

Earwig:

1, female sitting on her eggs; 2, young just emerged from eggs.

These insects indeed connect the true *Orthoptera* with the *Neuroptera*. Their legs are formed for running, and not for leaping; their wing-covers (*elytra*)—which are very small, and hide only a small part of the abdomen—are of firmer substance than in the other *Orthoptera;* the wings, of which the structure is membranous, with radiating veins, are folded twice, both longitudinally, in a fanlike manner, and transversely; the organs of the mouth resemble those of the true *Orthoptera*, with which also earwigs agree in the im-

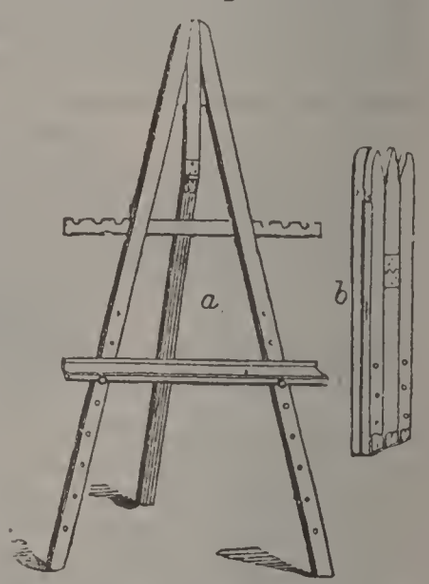
portant character of *semi-complete* metamorphosis; the larvæ and pupæ much resembling the perfect insect, running about and feeding in the same manner, but the larvæ being destitute of wings and wing-covers, the pupæ having them only in a rudimentary state. Earwigs have the body narrow, and of nearly equal breadth throughout, the head exposed, the mandibles very strong and horny, the antennæ long and thread-shaped. The abdomen bears at its extremity a large pair of forceps, apparently of use as an instrument of defense. Earwigs abound in moist situations, as under the decayed bark of trees, under stones, among decaying straw, etc. They feed on both animal and vegetable food; the COMMON E. (*F. auricularia*), very abundant in Britain and in most parts of Europe, is troublesome to gardeners by eating the leaves of plants and petals of fine flowers; but the injury which it does is probably more than compensated, particularly as to field-crops, by the destruction of multitudes of smaller insects, as *thrips*, *aphis*, etc. The appearance of this insect is far from agreeable, and its mandibles and forceps are suggestive of unpleasant possibilities, which, however, seem never to be realized, though it is a frequent visitor of houses, particularly those of which the walls are covered with foliage. It is curious how extensively prevalent the notion is that earwigs creep into the ear. To this they owe their English name E. (from *ear*, and Sax. *wicga*, a worm or grub), according to one supposition. But it is likely that, as in the French name for these insects, *Perceoreille* (ear-piercer), the name was suggested by the resemblance of the adult caudal forceps to an instrument used to pierce the ear for the wearing of ear-rings. Others, with little probability, derive the name from the ear-like outline of the hind wings. In the United States, where these insects are not common enough to annoy gardeners, the name is absurdly given to some myriapods. No E. is known to have entered a human ear. Of their habit of creeping into holes, particularly to hide during the day, gardeners take advantage to make earwig-traps of different descriptions.

Hind Wing of Earwig, magnified.

It is an interesting peculiarity in the habits of these insects that the female E. sits upon her eggs and hatches them like a hen; she also gathers her young ones around her and under her in the most affectionate manner. The observations of De Geer on this point have been confirmed by Mr. Spence and others.

EASE, n. *ēz* [F. *aise*, satisfaction, ease—from mid. L. *asa*, a handle, convenience: It. *asio;* Port. *azo*, convenience, leisure: Gael. *athais*, ease]: rest from labor; freedom from pain, want, or anxiety; freedom from difficulty; freedom from constraint or formality: V. to give relief or rest to; to free from pain; to alleviate. EASING, imp. *ē'zĭng*. EASED, pp. *ēzd*. EASEMENT, n. *ēz'mĕnt*, that which gives ease; convenience; assistance; in *law*, any continuous privilege or convenience connected with land or tenement, which one party possesses of another gratuitously. EASY, a. *ē'zĭ*, free from pain or annoyance; free from anxiety or care; quiet; not difficult or laborious; not rough or uneven; complying; satisfied; comfortable; not stiff or constrained; credulous; in *com.*, not straitened or restricted as regards money; plentifully supplied; opposed to *tight:* AD. without troubling. EA'SILY, ad. *-ĭ*. EA'SINESS, n. freedom from difficulty, constraint, or formality. AT EASE, without pain or anxiety. EASEFUL, a. *ēz'fŭl*, peaceable; quiet. EASY-CHAIR, an arm-chair cushioned all over.—SYN. of 'ease, n.': quiet; rest; repose; tranquillity; lightness; readiness; relief; leisure; refreshment; peace;—of 'ease, v.': to relieve; calm; assuage; allay; mitigate; appease; pacify;—of 'easy': secure; tranquil; facile; free; unconstrained; smooth; yielding; ready.

EASEL, n. *ē'zl* [Ger. *esel*, an ass, an easel]: frame for supporting a painter's canvas or panel at the proper height and angle.



Easel:
Of modern construction.
a, easel open for use; *b*, easel folded up.

EASE'MENT, in Law: defined as 'a privilege without profit, which the owner of one neighboring tenement hath of another, existing in respect of their several tenements, by which the servient owner is obliged "to suffer or not to do" something on his own land for the advantage of a dominant owner.'—Gale on *Easements*. The rights comprehended under the term E. are very important; they include rights of water, rights of way, rights to light and air, rights to support from a neighboring soil or house, rights to carry on an offensive trade, etc. An easement is an incorporeal hereditament (q.v.), and corresponds in many respects with a servitude (q.v.) in Scotch law, but carrying no title to the profit of the soil. An E. cannot exist apart from an estate in land, it being necessary that there should be two tenements, the one enjoying the right (dominant), the other over which it is enjoyed (servient). An E. must be constituted by deed or by prescription (q.v.). It may be extinguished by an actual

or implied release. When a party entitled to enjoyment of an easement is disturbed in that enjoyment, he may enforce his right by action at law, or he may enter upon the servient tenement and abate the nuisance himself The law of easement in the United States is regulated by the same principles that prevail in England; see Kent's *Commentaries on American Law.*

EAST, n. *ēst,* [Ger. *ost;* Icel. *austr;* Dut. *oost,* the east: Esthon. *ea,* ice, *east,* from the ice, also the icy wind]: that part of the heavens where the sun rises; the eastern parts of the earth: ADJ. toward the rising sun. EAST'ERLY, a. *-ėr-lĭ,* coming from the east; situated toward the east: looking to wardthe east: AD. in the direction of east. EAST'ERN, a. *-ėrn,* situated or going toward the east; living or dwelling in the direction of the east; oriental. EAST'ERLING, n. the native of a country eastward of another. EAST'ING, n. among *seamen,* the distance a ship makes good in an east direction. THE EAST, eastern regions; Asiatic countries. EAST'WARD, ad. *-wėrd,* [AS. *weard,* situation, direction]: toward the east. THE EASTWARD, n. the direction toward the east.

EAST: vaguely speaking, that quarter of the horizon where the sun rises, or which a person with his face to the south has on his left hand. It is only at the equinoxes that the sun rises exactly in the east point. A line at right angles to the meridian of a place, points exactly east and west: see MERIDIAN and HORIZON.

From very early times, the east has been invested with a certain sacred character, or at least held in respect over other points of the compass. It was the practice of the ancient pagans to fix their altars in the eastern part of their temples so that they might sacrifice toward the rising sun, which in itself was an object of worship. The custom of venerating the east was perpetuated by the early Christian church from various records in the Scriptures: for instance: 'The glory of the God of Israel came from the way of the east,' Ezek. xliii. 2: 'There came wise men from the east to Jerusalem,' Matt. ii. 1: 'And, lo, the star, which they saw in the east, went before them,' Matt. ii. 9. These passages attribute no sacredness to the east, yet the incidents which they recorded supplied material for reverence which tradition gradually heightened. Thus, it was said that Christ had been placed in the tomb with his feet toward the east, and that at the day of judgment he should come from the eastward in the heavens. Looking toward the sun in the east in praying or repeating the creed, was thought to put worshippers in remembrance that Christ is the sun of righteousness, and such an attitude was accordingly adopted as an aid to devotion. From these various circumstances, the building of churches with the chancel (q.v.) to the east (see ORIENTATION), bowing to the east on uttering the name of Jesus, and burying with the feet to the east, were introduced as customs in the church. In recent times there has been a general disregard of the practice of turning formally with the face to the east on repeating the

creed, and, as is well known, the attempt to revive it by a party in the English church has caused considerable opposition. It is a curious instance of the inveteracy of popular custom, that in Scotland, where everything that savored of ancient usage was set aside as popish by the reformers, the practice of burying with the feet to the east was maintained in the old churchyards, nor is it uncommon still to set down churches with a scrupulous regard to east and west. In modern cemeteries in England and Scotland, no attention appears to be paid to the old punctilio of interring with the feet to the east, the nature of the ground alone being considered in the disposition of graves.

EAST AFRICA, British, comprises an area of over 1,200,000 square miles, situated to the north of German East Africa and south and west of Italian Northeast Africa, and extending inland to the Congo State and the Anglo-Egyptian Soudan, but here the boundaries are not definitely settled. It has a coast line of about 450 miles, from the river Umba on the south to the river Juba on the north. This vast region has a population estimated at over 13,000,000, and includes Masailand and the Kenia Uplands, parts of Somaliland, and Gallaland, lakes Rudolf and Stefanie, the Albertine head-waters of the Nile, lake Albert, part of Albert Edward Nyanza, the northern part of Victoria Nyanza, the countries of Uganda, Kavirondo, Unyoro, Ankole, Koko, etc. Great Britain has authority also over the coast islands of Pemba and Zanzibar. In 1888 a charter was granted to a company called the Imperial British East Africa Company, from the initials of whose name the country was for a time called Ibea, and on this body devolved the preliminary work of opening up the whole country. In 1893, however, the company retired from Uganda owing to political and other difficulties, and the protectorate was declared in the following year over that portion of the country. In 1896 this Uganda Protectorate was extended to the neighboring regions of Unyoro, Usoga, Ankole, etc., and the whole district of Uganda is now placed under a commissioner resident at Entebbe, the administrative capital of Uganda. The province of Uganda is recognized as a native kingdom under a 'Kabaka.' For Europeans and non-natives of the Uganda Protectorate, justice is administered by the British consular courts. Forts have been established at various places and are garrisoned mainly by Soudanese troops, part of whose duty is to restrain the Unyoro and other peoples from predatory incursions on their neighbor's territory. All the rest of the country, with the exception of the islands of Zanzibar and Pemba, constitutes the East Africa Protectorate declared in 1895. (See East Africa Protectorate.) In the interior are many extensive plateaus, the highest mountains of this part of Africa are Mt. Kenia (18,370 feet), Mt. Elgon, and in the extreme west Ruwenzori. The most important rivers are the Nile and its head-waters, with the Tana, Juba, and Sabaki, entering the Indian Ocean. A considerable trade is carried

on, chiefly with Great Britain and British India. The natives of Uganda and other parts show great skill in various arts, and great capacity for adaptation to European conditions and customs. Zanzibar and Pemba are still ruled by a sultan, but form a British Protectorate. Some German firms are now in trade here and some trade has been established with Persia and Arabia.

EAST AFRICA, GERMAN, the German possessions in East Africa, acquired in 1885–90, lying immediately to the south of British East Africa, and having an estimated area of about 400,000 square miles, and estimated population of 4,000,000, of whom 1,000 are Europeans. They are bounded on the north by a line running northwest from the Umba River to the eastern shore of the Victoria Nyanza, and continuing west from this lake to the Congo State. Lake Tanganyika forms the western boundary, and thence a line to Lake Nyassa and the River Rovuma form the southwestern and southern boundaries. In 1894, September, it was agreed that the German-Portuguese frontier should follow parallel lat. 10° 40′ S. from the coast to its intersection with the River Rovuma, leaving Kionga and the mouth of the Rovuma to Germany, and Cape Delgado to Portugal. Several stations have been established by the German East Africa Company. A narrow gauge railway from the coast to the lakes Victoria Nyanza and Tanganyika was projected in 1899. The products of the country are coffee, tobacco, cotton, ivory, caoutchouc, and gum. The highest mountain is Kilimanjaro, reaching 19,600 feet. Among the chief river are the Rovuma, Rufiji, Kingani, and Pangani, flowing to the Indian Ocean; the Kagera, Shimiyu, and Ruwara flowing into Victoria Nyanza; and the Malagarazi flowing into Tanganyika. In the north there are several small lakes, and in the southwest the larger salt lake, Rukwa or Hikwa. On the coast the chief towns are Mikindani, Lindi, Dar-es-Salaam, Bagamoyo Pangani, Wanga, and the English Mission station Saadani. Inland there are Mpwapwa, Kanyen, Tabora (Kazeh), Urambo, and Ujiji, the last named being situated on the shore of Tanganyika. The country is under an imperial governor.

EAST AFRICA, PORTUGUESE: The possessions of Portugal, comprising the three provinces of Lourenco, Marques, Mozambique, and Zambesi. Its coast line extends south from Cape Delgado, the southern extremity of the coast-line of German East Africa to Kosi Bay, just below Delagoa Bay, at a point separating British from Portuguese territory, as fixed by the Anglo-Portuguese agreement of 1891; the northern boundary is the River Rovuma, running west from Cape Delgado to Lake Nyassa. The frontier between German and Portuguese East Africa runs along parallel lat. 10° 40′ S. from the coast to its intersection with the river Rovuma, leaving the mouth of the Rovuma and Kionga to Germany, and Cape Delgado to Portugal. The eastern boundary is the lake and British Central Africa, or the Nyassa Protectorate down to the

junction of the Shiré with the Zambesi; while from that point the British South Africa Company's territory, including Mashonland and Matabeleland, and the former South African Republic, form the boundary. Its area is about 3,000,000 square miles; population about 1,600,000. The principal exports are oilnuts and seeds, caoutchouc, and ivory. The Mozambique Company administers Sofala and Manica, the Nyassa Company has jurisdiction in the northern part between Lake Nyassa, the Rovuma, and the Lurio, and there is also a Zambesia Company. There is a railway from Delagoa Bay to Pretoria, and one from Beira to Fort Salisbury in the Transvaal. The coast-lands are low-lying and not very healthy, but in the region of the Namuli Mountains there is one of the finest and most beautiful tracts of country in the whole continent. There are several important rivers including Zambesi, Limpopo Rovuma, Sabi, Pungwe, Lurio, Mtepwesi, Lukuga, and many others. The most important towns are Lourenço Marques, Inhambane, Sofala, Beira, Quilimane, Chinde, Mozambique, Ibo, Zumbo, Tete, and Sena. Gold is found in the Manica region on the west, and has been worked by British capitalists.

EAST AFRICA PROTECTORATE: British possessions in East Africa, extending about 400 miles along the coast north from Umba, at the mouth of the Umba River. The south boundary runs from Umba in a northwest direction to the intersection of the Victoria Nyanza with the first parallel of N. lat,. skirts the north shore of the lake, and thence west to the boundary of the Congo Free State. The River Juba begins the north boundary, which from the intersection of the river with the 6th parallel of N, lat, runs to the 35th meridian E. lon., and follows that to its intersection with the blue Nile; the Congo Free State and the west water-shed of the basin of the upper Nile forming the west boundary. The total area is about 300,000 square miles, embracing a great part of Somaliland, the Equatorial province, Usoga, Unyoro, etc. It is subdivided so as to consist of seven provinces and a tract of unorganized territory in the northwest. The provinces are under a sub-commission, and are divided into districts and subdistricts. Nandi and Kericho were formerly under the eastern province of Uganda, but 1902, April 1, they were transferred to the East Africa Protectorate. Mombasa is the largest town and the capital of the whole Protectorate. Pop. of Mombasa 27, 000. The population of the Protectorate is estimated at 4,000,000. The Imperial East Africa Company opened up the country, having in 1888 obtained a concession of territory from the Sultan of Zanzibar, and a charter from the British government An arrangement for buying them out, was, however, made in 1895. The chief ports are Mombasa, the capital, Lamu, Umba, and Kismayu.

The prevailing religious belief is paganism of some form, but a large number are Mohammedans. A number of Christian missions have been established, and elementary schools founded. Legislation is by ordinances made by

the commissioner, the codes of India being followed as far as applicable. The higher courts are at Zanzibar and Mombasa. Slavery is legal on the 10-mile coast strip, but nowhere else under the Protectorate. The principal exports are ivory, rubber, grain, cattle, hides, horns, gum-opal and fruits. The principal imports are Manchester and Bombay goods, brass, wire, beads, and some provisions. Trade is chiefly under the control of the East Indian merchants. In 1901 the railroad from Mombasa to Kisuma on Lake Victoria was completed and other railroads are in process of construction. Post-offices, telegraph lines, and other public improvements have been introduced and are being extended.

EAST AURORA, N. Y., village in Erie County, on the Western N. Y. & P. R.R., 18 miles southeast of Buffalo. The place is noted as the home of the colony of Roycrofters. (See ROYCROFTERS.) It is a residential suburb of Buffalo.

EASTBOURNE, *ēst'bŭrn:* fashionable watering-place in the s.e. of Sussex, England. It lies to the west of Pevensey Bay and is 2½ m. s.s.e. of Beach Head (q.v.). In the vicinity are fine drives and walks; and the town has several theatres and libraries. Devonshire park and pavilion, promoted as places of public entertainment, are of great beauty. The churches are very fine. Remains of a Roman villa, bath, and tessellated pavements have been found here. Eastbourne is one of the leading educational centres on the s. coast of England. Pop. (1901) 43,337.

EAST CAPE: most easterly headlands of the island of Madagascar, of the n. island of New Zealand, and of Siberia or Asiatic Russia. The *first* (in Madagascar) is in lat. 15° 20′ s., and long. 50° 15′ e.; the *second* (in New Zealand) in lat. 37° 40′ s., and long. 178° 40′ e., being almost precisely the antipodes of Carthagena in Spain; and the *third* (in Siberia) is that extremity of the Old World which is nearest to the New, being separated by Behring's Strait (q.v.) from Cape Prince of Wales in America: it is in lat. 66° 6′ n. and long. 169° 38′ w.; or rather, to follow the natural reckoning, 190° 22′ e. The latter is a bold, rocky promontory, almost cut off from the mainland by swamps and shallow lakes. On the north side is a village, Uédle, of less than 100 huts with a population of about 260.

EAST'CHEAP, at one time a large market in the east of London. It occupied what is now Billingsgate and Leadenhall market. Several streets or roads converged at the great square, then called Eastcheap. Two of those highways were the old Roman roads which extended northeast and northwest out of the city. In Saxon times these roads were known as Watling and Ermine streets and met on the north side of London Bridge. On account of the situation of these roads Eastcheap became famous for its taverns. Some of the old taverns, notably 'Boar's Head' mentioned by Shakespeare and others of the English writers, were at Eastcheap. At the north end of London Bridge there is now a small street called Eastcheap.

EASTER.

EASTER, n. *ēs tėr* [AS. *Eoster*, Easter—from *Eostra*, the goddess of spring, or of the rising day, whose festival was held in April: Icel. *ast*, love; the old name was *Pasch* (q.v.) from Gr. *pascha*, the passover]: the festival of the resurrection of Jesus Christ, not traceable to the times of the apostles; but evidently of very ancient origin in the early church as taking the place of the Jewish passover, with whose date it was deemed nearly to coincide. In the ancient church, the celebration of Easter lasted eight days. After the 11th c., however, it was limited to three, and in later times, generally to two days. It was formerly the favorite time for the rite of baptism. The courts of justice were closed, and alms dispensed to the poor and needy, who were even feasted in the churches—a custom which led to much disorder. Slaves also received their freedom at that season; and as the austerities of Lent were over, the people gave themselves up to enjoyment; hence the day was called the 'Sunday of joy' (*Dominica gaudii*). To the popular sports and dances were added farcical exhibitions, in which even the clergy joined in some places, reciting from the pulpits stories and legends, with a view to stir the hearers to laughter (*risus paschalis*). Against this indecency, the Reformers of the 16th c. loudly and successfully raised their voices. During the whole week before Easter—that is, in the interval between Palm Sunday and the beginning of the Easter festival—daily services were held. See GOOD FRIDAY: HOLY WEEK: PASSION WEEK.

On Easter day, the people saluted each other with the Easter kiss, and the exclamation *Surrexit* (He is risen); to which the reply was *Vere surrexit* (He is risen indeed). The chief solemnity always consisted of the celebration of the Lord's Supper.

The proper time for the celebration of Easter has occasioned no little controversy. In the 2d c., a dispute arose on this point between the Eastern and Western churches. The great mass of the Eastern Christians celebrated Easter on the 14th day of the first Jewish month or moon, considering it to be the successor and the equivalent to the Jewish Passover. The Western churches celebrated it on the Sunday after the 14th day, holding that it was the commemoration of the resurrection of Jesus. The Council of Nice (325) decided in favor of the Western usage, branding the eastern usage with the name of the 'quartodeciman' heresy. This, however, settled only the point that Easter was to be held, not upon a certain day of the month or moon, but on a Sunday. The proper astronomical cycle for calculating the occurrence of the Easter moon was not determined by this council. It appears, however, that the Metonic Cycle (q.v.) was already in use in the West for this purpose; and it was on this cycle that the Gregorian Calendar, introduced 1582, was arranged. The method on which this calendar is constructed is too complex for description here: see an elaborate account of the whole matter by Prof. De Morgan in the *Companion to the British Almanac* 1845. The time of Easter—that being

the most ancient and important of all the movable feasts of the Christian Church—determines all the rest. It was debated, at the time of the introduction of the Gregorian Calendar, whether Easter should continue to be movable, or whether a fixed Sunday, after Mar. 21, should not be adopted. It was deference to ancient custom that led the ecclesiastical authorities to adhere to the method of determination by the moon. It must be remembered, however, that it is not the actual moon in the heavens, nor even the mean moon of astronomers, that regulates the time of Easter, but an altogether imaginary moon, whose periods are so contrived that the new (calendar) moon always follows the real new moon (sometimes by two, or even three days). The effect of this is, that the 14th of the calendar moon—which had, from the times of Moses, been considered 'full moon' for ecclesiastical purposes—falls generally on the 15th or 16th of the real moon, and thus after the real full moon, which is generally on the 14th or 15th day. With this explanation, then, of what is meant by 'full moon,' viz., that it is the 14th day of the calendar moon, the rule is, that Easter Day is always the first Sunday after the paschal full moon, i.e., after the full moon which happens upon or next after Mar. 21 (the beginning of the ecclesiastical year); and if the full moon happens upon a Sunday, Easter Day is the Sunday after. For any given year, the day on which the paschal full moon falls, and then Easter Day, are found by the following table and rule—

Days of the Month.	Dom. Letter.	Golden Number.	Days of the Month.	Dom. Letter.	Golden Number.
March 21	C	14	April 8	G	..
" 22	D	3	" 9	A	15
" 23	E	..	" 10	B	4
" 24	F	11	" 11	C	..
" 25	G	..	" 12	D	12
" 26	A	19	" 13	E	1
" 27	B	8	" 14	F	..
" 28	C	..	" 15	G	9
" 29	D	16	" 16	A	..
" 30	E	5	" 17	B	17
" 31	F	..	" 18	C	6
April 1	G	13	" 19	D	..
" 2	A	2	" 20	E	..
" 3	B	..	" 21	F	..
" 4	C	10	" 22	G	..
" 5	D	..	" 23	A	..
" 6	E	18	" 24	B	..
" 7	F	7	" 25	C	..

First ascertain the Dominical Letter (see under DOMINICAL) taking the second, where there are two—and the Golden Number (see EPACT); look for the golden number in the third column of the table, and opposite to it stands the day of the full moon; then look for the dominical letter, next after the day of full moon, and the day standing opposite the dominical letter is Easter Day. It sometimes

happens that Easter Day, as thus determined, is different from what it would be if by 'full moon' were understood the astronomical full moon. Thus, in 1818, Easter day, by the calendar, fell, and was celebrated on Mar. 22, the earliest possible day, though the full moon was on that day; and in 1845, it again fell on the day of the actual full moon (Mar. 23).

From 1889 to the end of the present century, Easter will occur on the dates following:

1889, Apr. 21	1893, Apr. 2	1897, Apr. 18
1890, Apr. 6	1894, Mar. 25	1898, Apr. 10
1891, Mar. 29	1895, Apr. 14	1899, Apr. 2
1892, Apr. 17	1896, Apr. 5	1900, Apr. 15

Good Friday is the Friday before Easter; *Ascension Day* is Thursday the 40th day after Easter; *Whitsunday*, or the *Pentecost Day* is the 50th day after Easter, i.e. the Sunday 7th after Easter.

One object in arranging the calendar moon was, that Easter might never fall on the same day as the Jewish Passover. They did occur together, however, in 1805, Apr. 14; and in 1825, Apr. 3; and will do so again in 1903, Apr. 12; in 1923, Apr 1; in 1927, Apr. 17; and in 1981. Apr 19. The Jewish festival usually occurs in Passion week, and never before Mar. 26, or after Apr. 25 (new style). On the other hand, the Christian festival is never before Mar. 22, or after Apr. 25. In 1761 and 1818, Easter fell on Mar. 22; but neither in this nor the following century will this date for it recur. In 1913, it will fall on Mar. 23, as it did in 1845 and 1856. The latest Easters in this century and the following, occur in 1886 and 1943, on Apr. 25. In 1848, Easter fell on Apr. 23; and in 1859, on Apr. 24.

Popular Observances.—Many of the popular observances connected with Easter are clearly of pagan origin. The goddess Ostara or Eastre seems to have been the personification of the morning or east (q.v.), and also of the opening year or spring. The Anglo-Saxon name of April was Estormonath; and it is still known in Germany as Ostermonath. The worship of this being seems to have struck deep root in n. Germany, and was brought into England by the Saxons. It continued to be celebrated in many parts in n. Germany till the beginning of the present century, by the kindling of bonfires and numerous other rites: see Beltein. Like the May observances of England, it was especially a festival of joy. It was the usual policy of the ancient church, seeking to convert surrounding pagans, to endeavor to give a Christian significance to such of the rites as could not be rooted out; and in this case, the conversion was particularly easy. Joy at the rising of the natural sun, and at the awaking of nature from the death of winter, became joy at the rising of the Sun of Righteousness—at the resurrection of Christ from the grave. The bonfires can be traced in the great 'paschal tapers,' sometimes weighing 300 lbs., with which the churches were lighted on Easter Eve. In the ancient church dis-

bursements of St. Mary-at-Hill, in the city of London, there is even an entry 'For a quarter of coles for the hallowed fire on Easter Eve, 6*d.*'

The most characteristic Easter rite, and the one most widely diffused, is the use of *Pasch* (i.e., Easter) *eggs*. They are usually stained of various colors with dye-woods or herbs, and people reciprocally make presents of them; sometimes they are kept as amulets, sometimes eaten; games are also played by striking them against one another. In some moorland parts of Scotland, it used to be the custom for young people to go out early on 'Pasch Sunday' and search for wild fowls' eggs for breakfast. and it was thought lucky to find them. There can be little doubt that the use of eggs at this season was originally symbolical of the revivication of nature—the springing forth of life in spring. The practice is not confined to Christians; the Jews used eggs in the feast of the Passover; and we are told that the Persians, when they keep the festival of the solar new year (in March) reciprocally present each other with colored eggs.

From the Christian point of view, this 'Feast of Eggs' has been usually considered as emblematic of the resurrection and of a future life.

EASTER ISLAND, originally Davis's Land: detached spot of land on the Pacific, lat. 27° 10′ s., and long. 109° 26′ w. It is of volcanic origin, rising 1,200 ft. above the sea; and it is moderately fertile, but almost destitute of water. It belongs to the Polynesian archipelago, of which it forms the e. extremity. On this island, of 30 m. circumference, now inhabited by about 150 wretched savages, there exist multitudes of rude stone statues, some of colossal size, and standing on long platforms of Cyclopean masonry. The present inhabitants, whose language is radically the same as that of Tahiti, have no tradition of the race that made them. The existence of these sculptures is thought to strengthen the conclusion arrived at on other grounds, that the Polynesian islands are relics of a submerged continent.

EASTER MONDAY: in *chh. cal.*, the day after Easter Sunday. In England it has long been the first great popular festival of the year. In 1871, it was made a bank holiday.

EASTERN ARCHIPELAGO: see Malay Archipelago.

EASTERN CHURCHES: name applied to several divisions of bodies of Christians, comprising the *Orthodox Greek Church*, with 10 independent organizations, and about 98, 016,000 adherents, of whom about 61,940,000 are in Russia (with 1,500,000 dissenters), 7,000,000 in Turkey, 5,250,000 in Roumania, 2,927,000 in Austria-Hungary, 2,200,000 in Greece, 2,007, 000 in Bulgaria, 1,939,000 in Servia, and 232,000 in Montenegro; *National Churches*: Abyssinian, 1,250,000, Armenian, 1,140,000 Coptic, 500,000, Jacobite, 350,000 Christians of St. Thomas, in India, 350,000, Nestorian, 250,000, and Maronite, 250,000; and

United Churches; United Greek, in Austria-Hungary, 4,036,000, in Turkey, 1,000,000, and in Russia 55,000, United Nestorian, in India, 150,000, in Turkey and Persia, 20,000, United Armenian, 100,000, United Jacobite, in India, 160,000, United Abyssinian, 50,000, and United Coptic, 10,000.

EASTERN EMPIRE: see BYZANTINE EMPIRE.

EASTERN QUESTION: question as to the distribution of political power in eastern Europe and the Asiatic continent. The vast relative extent of the Russian empire on the map of Europe, or of the world, and the knowledge that for some generations it has steadily increased, raise the question whether the liberties of Europe and mankind are endangered by the preponderance of the power just mentioned, with its semi-barbarous hordes. The majority of minds, at least in England, France, and Italy, apprehend some danger; and with them the E. Q. is simply this: How is the proper balance of power to be preserved against the menacing progress of Russia toward s. and w. Europe in one direction, and toward India in the other? The British Indian empire is felt to be ultimately at stake Of old, the stereotyped answer to the inquiry was, By maintaining the integrity of the Ottoman empire. In support of this view the Crimean war was carried on 1854–56, both the great parties of the state in England concurring as to its necessity, the only dissentients being a small minority of the community, led, however, by Cobden, Bright, Milner, Gibson, and others. By the time of the next Russo-Turkish war, 1877–8, many of the liberal party had begun to doubt whether the Crimean war had been just, and whether it had gained any lasting advantage. Their sympathies, alienated from Turkey by what were called the Bulgarian atrocities, were given to the old Christian nationalities, Servians, Greeks, and others, held down by Turkey, and, within certain limits, to Russia as advancing to their deliverance. But their desire is that the emancipated Christians shall shake off Russian influence, and, prizing their personal independence, maintain it, if need be, against the great northern power, and so conduct themselves as to encourage the Great Powers to transfer Constantinople to their keeping if the domination of the Turks in the latter capital should come to an end. The English Conservative party, on the contrary, estimate the long oppressed Christians of the Ottoman empire less, and the Turks more highly, and are prepared to defend, and, if need be, repeat the policy of the Crimean war. Acute crises in the E. Q. have seemed to recur in nearly periodical cycles of 20–25 years.

EASTERN (or ORIENTAL) RITE: designation of the rituals of those branches of the Rom. Cath. Church which acknowledge the supremacy of the pope, and are permitted to employ rituals differing in important provisions from that of the strict Latin usage. The branches include many Armenian, Coptic, Greek, and Syrian bodies, who have had rituals of their own from very remote times. The language employed, instead of the Latin, is that of the different nationalities, and the rituals in general permit the

laity the use of both elements in the Eucharist, and sanction marriage in the subordinate orders of the priesthood.

EASTERN SHORE: in general the entire peninsula lying between Delaware Bay and the Atlantic Ocean, and Chesapeake Bay, comprising all of Delaware and portions of Maryland and Virginia; but more particularly the portions of Maryland and Virginia east of Chesapeake Bay. It formerly contained the most exclusive and aristocratic settlements in the southern states, but now has a large industrial and commercial importance. The climate is very mild; its waters abound in wild fowl; and there are extensive mines of bog-iron ore, valuable deposits of kaolin, and large tracts of choice oak forests. Oyster-dredging, peach-growing, market-gardening, and the fisheries are the chief industries.

EASTER TERM, Legal: term of sitting of English courts, now extending from Apr. 15 to May 8, with slight variations in some years to avoid sittings on days too near Easter: see Law Terms.

EASTHAMPTON, *ēst-hăm'pton:* town, Hampshire co., Mass.; on the Conn. river and the New Haven and Northampton railroads; 5 m. s.w. of Northampton, 17 m. n.n.w. of Springfield, 71 m. n.w. of New Haven. It contains banks, the Williston Seminary for young men—a well-endowed institution of high rank— a public library, several churches, and manufactures of vulcanized rubber, buttons, pumps, suspenders, thread, and cotton yarn, and machinery. Pop. (1900) 5,603; (1910) 8,524.

EAST HAMPTON: town in Suffolk co., N. Y. 1 m. from Atlantic Ocean, 7 m. s.e. of Sag Harbor, on the Long Island railroad. The township comprises the east end of Long Island, and at the extremity is Montauk Point, on which is a noted lighthouse. Fruits and vegetables thrive in the west portion and excellent pasturages are found in in the east. The salubrity of the climate makes it popular as a resort in summer, and the multitude of its wild fowl attract sportsmen in autumn. The village contains several churches and an academy. Pop. (1910) 4,000.

EAST HARTFORD: town, Chatham, township. Hartford co., Conn., on the New York and New England railroad, 2 m. from Hartford, of which it is an important suburb, and 33 m. from New Haven. Its industries include a paper mill, carriage factories, and other important manufactures. It has a graded school, fine churches, and many public buildings, and weekly newspapers. Pop. (1900) 6,406; (1910) 8,138.

EAST HUMBOLDT MOUNTAINS, *ēst hŭm'bōlt:* range in the s. part of Elko co., Nevada; extends n. and s.; is pierced by Fremont pass and Secret valley; has Ruby valley on the e., and Huntingdon valley on the w.; contains two lakes, Franklin and Ruby, fed by springs; has several peaks exceeding 12,000 ft. in height; and has valuable forests of pine and fir.

EAST INDIA COMPANY: incorporated company of English merchants, formed to carry on trade with the E. Indies. A charter was granted by Queen Elizabeth, 1600, Dec. 31, to a number of London merchants, under the title of 'The Governor and Company of Merchants of London trading to the East Indies.' From the time when Vasco de Gama effected the eastern passage to India, by doubling the Cape of Good Hope, 1479, the Portuguese carried on an extensive trade with that country, unaffected by rivals until nearly a century afterward, when the Dutch and the English began to compete with them. This competition became formidable when two 'East India Companies' were established, one at Amsterdam, and one in London. It is of the latter of these that we here treat. The charter was exclusive, as is usual in such cases; prohibiting the rest of the community from trading within the limits assigned to the Company. Those limits were enormous, comprising the whole space, land and sea, from the Cape of Good Hope eastward to Cape Horn—i.e. the whole of the Indian and Pacific Oceans. The charter was for 15 years. The Company speedily sent out ships to Java and Sumatra, which returned with calicoes, silk, indigo, and spices. It was then determined to make some kind of settlements on the coast of Hindustan itself; and about 1612, the Company obtained permission from the native princes to establish factories or agencies at Surat, Ahmedabad, Cambay, and Gogo.

The Company's charter was renewed from time to time, with various modifications, but not without much contention and difficulty. Gradually establishments were formed in Java, Sumatra, Borneo, Celebes, Malacca, Siam, the Banda Islands, and other places in the East; as well as on the Coromandel and Malabar coasts of India itself. The beginning of Madras dates 1640, of Calcutta 1645, and Bombay 1665, as chief establishments of the Company. In 1662, Charles II. gave them permission 'to make war and peace on the native princes'—a privilege of which they largely availed themselves for nearly 200 years.

In 1698, the crown granted a charter to a *new* E. I.C., which offered a loan of £2,000,000 to the state; but this naturally led to wranglings, and the two companies were united by an act of parliament 1702. The constitution then established was maintained with little alteration as long as the Company existed. Every shareholder who held £500 of the Company's stock became a member of the court of proprietors; and this court had legislative functions in all that related to the Company's affairs. The proprietors annually chose 24 to form a court of directors, from those of their number who held not less than £2,000 of stock. Six of the directors went out of office every year; they retired in rotation, so that each had four years of office. It was a general custom with the proprietors to elect the same persons as directors over and over again. The court of proprietors was to meet once a year, or oftener if necessary: the court of directors as often as the directors chose, provided 13 were present. Theoretically,

the constitution of the Company was very democratic; but practically the affairs were in the hands of the directors; for the proprietors took little other interest than in receiving their half-yearly dividends. The proprietors had from one to four votes each, according to the amount of stock held by them. The board of control, of later formation, bore relation to the governmental affairs of India.

Properly speaking, the Company were only merchants: sending out bullion, lead, quicksilver, woolens, hardware, and other goods to India; and bringing thence calicoes, silk, diamonds, tea, porcelain, pepper, drugs, saltpetre, etc. Not merely with India, but with China and other parts of the East, the trade was monopolized by the Company; and hence arose their great trade in China tea, porcelain, and silk. By degrees, avarice and ambition led the Company, or their agents in India, to take part in the quarrels among the native princes; this course gave them power and influence at the native courts, whence arose the acquisition of sovereign powers over vast regions. India thus became valued by the Company, not only as commercially profitable, but as affording to the friends and relations of the directors opportunities of making vast fortunes by political or military enterprises. For the political affairs of the Company, and the rise of a British empire in India, see INDIA, BRITISH; it will suffice here merely to state, that no *national* or *patriotic* motive marked the beginning of this course.

In 1744, the Company obtained a renewal of their charter till 1780, but not without a loan of £1,000,000 to government; for the monopoly was distasteful to the nation at large. France, too, had an E. I. C., and the struggles between the two companies for power in southern India, led to constant warfare between them during the remainder of the century. Other loans to government were the means of obtaining further renewals of the charter in later years. In 1833, the legislature took away all the *trading* privileges of the company. The dividends to proprietors of East India stock were thenceforward to be paid out of taxes imposed by the company on the people of India, in such provinces as were under British dominion. From that year the company's powers became anomalous; the company could not *trade*, and could not *govern* without the sanction and continued interference of the imperial government. The wars in India, since that year. have been waged by England as a nation, rather than by the company; and England practically, though not nominally, became responsible for the enormous cost of those wars. In 1853, the charter was again renewed, with a further lessening of the power of the company. and an increase of that of the crown.

Had not the Indian revolt occurred in 1857, the last charter would have remained in force until 1873; but that gigantic calamity led to the resolution—a resolution the wisdom of which was disputed by many of the best judges of Indian affairs—to concentrate the power in the hands of the imperial

government. In spite of a strenuous resistance, in 1858, the company were forced to cede their powers, by an act which received the royal assent Aug. 2. The charter of 1853 had provided that £6,000,000 of India stock should have 10½ per cent. dividend *guaranteed* by England out of the revenues of India; and that parliament should redeem this stock at cent. per cent. premium any time after the year 1873. The act of 1858, therefore, contained due clauses for carrying out these provisions, and transferred the whole of the company's powers to the crown.

The company continued to exist, but for little other purpose than that of receiving and distributing dividends. Most of the distinguished men, military and political, till then in the company's service, accepted office under the crown, to assist the government by their general knowledge of Indian affairs. These affairs are now managed by a sec. of state for India at the new India Office. The valuable library and museum of the company have passed over to the crown; and an act of parliament (1873) provided for the paying off of the India stock, and the final extinction of the once famous East India Company.

EAST INDIA FLY: in *phar.*, an East Indian species of cantharis or blister beetle, larger and more powerful in its action than the ordinary Spanish fly.

EAST INDIES: as distinguished from *West Indies;* region including not merely the two great peninsulas of s. Asia, but likewise all the adjacent islands from the delta of the Indus to the n. extremity of the Philippines. They thus extend, to use round numbers, in latitude from 35° n. to 10° s., and in e. long. from 65° to 130°. At one time, the name of India had toward the east a still wider application, occasionally comprising Japan, nay, everything in that direction except China alone. See INDIA.

EAST INSULAR, a.: in *geog.*, pertaining or relating to the islands of the Eastern or Malay archipelago.

EASTLAKE, *ēst'lāk*, Sir CHARLES LOCK: 1795–1865; b. Plymouth, England; pres. of the Royal Acad. of London. He was educated at the Charter-house in London, and entered as a student at the Royal Academy. Subsequently, he went to Paris, where he studied and copied the great paintings then collected in the Louvre. The return of Napoleon from Elba compelled him to leave France. He went back to his native town, and supported himself by portrait-painting. When the *Bellerophon*, with Napoleon on board, appeared in the port of Plymouth, Eastlake profited by the opportunity, and produced his first important picture, *Napoleon at the Gangway of the Bellerophon, attended by some of his Officers.* In 1817, Sir Charles visited Italy and Greece, sketching assiduously in both countries. During a residence of several years in Rome, he executed his *Girl of Albano leading a Blind Woman to Mass, Isidas the Spartan, Pilgrims arriving in Sight of Rome,* and many others, illustrative of Italian customs and scenery. In 1827, he was elected an associate, and

1830 a full member of the Royal Academy. His *Greek Fugitives Prisoners to Banditti*, etc., added to his already great reputation; and in 1841 appeared what many deem his masterpiece, *Christ lamenting over Jerusalem*. It was immensely admired, the duplicate painted for Mr. Vernon being reckoned one of the most valuable pictures in the Vernon Gallery. *Hagar and Ishmael* was exhibited 1844; *Heloise* 1845; *The Escape of Francesco Novello di Carrara with Taddea d'Este, his Wife, from the Duke of Milan*, 1850; *Beatrice* 1855, etc. In 1850, he was elected president of the Royal Acad., at which time he received the honor of knighthood. Subsequently, he was appointed director of the National Gallery. Sir Charles also acquired high reputation as a writer on art. In 1847, he published *Materials for the History of Oil Painting*, a work of great learning and research. He contributed several articles to the *Penny Cyclopedia* on subjects belonging to his profession, and executed a translation of Goethe's *Farbenlehre*. In 1853, he received the title D.C.L. from the Univ. of Oxford.

EASTLAKE, Charles Locke, English art critic: b. Plymouth, England. He studied in the Royal Academy schools, but subsequently devoted himself to literary work and design, and was keeper and secretary of the National Gallery 1878–98. He has published: *History of the Gothic Revival in England* (1871); *Hints on Household Taste* (4th ed. 1874), a book which exerted much influence in its day; *Lectures on Decorative Art and Art Workmanship* (1876); *The Present Condition of Industrial Art* (1877); *Our Square and Circle* (1895); *Pictures at the National Gallery* (1898).

EAST LIVERPOOL, *ēst lĭv'ėr-pôl:* city in Columbiana co., Ohio. on the Ohio river, and on the Cleveland & Pittsburg railroad, 44 m. w. by n. of Pittsburg. The place was settled as early as 1795, and incorporated as a city in 1834. A number of potteries, one of them the largest in the United States, and two electrical porcelain works constitute the leading industries. There are also machine shops, brick-works, and a large sewer-pipe factory. The waterworks are owned and operated by the city, which has also a supply of natural gas. There is a Carnegie library and three parks, and the educational and religious features are equal to those of any town of its size in the country. The government is vested in a mayor, who is elected biennially, and a city council, the administrative officials as a rule being appointed by the mayor. Pop. (1910) 20,387.

EAST MAIN: formerly a portion of the Hudson Bay Territories, now incorporated in the Dominion of Canada; bounded n. by Hudson's Strait, and w. by Hudson's Bay down to its s. extremity, meeting Labrador on the e., and Canada on the s. This immense region, thrice as large as Great Britain, is generally bleak and sterile, yielding little to commerce but fish-oil and a few furs.

EAST MAIN: river, otherwise called the *Slade*, crosses the s. portion of the territory known as East Main, entering Hudson's Bay, here known as James's Bay, about lat. 52° 15′ n., after a course of 400 miles.

EAST'MAN, Charles Alexander, American homœopathic physician, and author: b. Redwood Falls, Minn., 1858. His father was a Santee-Sioux Indian, Many Lightnings (Jacob Eastman), and his mother a half-breed Sioux, Nancy Eastman. He was graduated at Dartmouth College 1887, and at the Boston University School of Medicine 1890. He married the poetess, Elaine Goodale, 1891. He served as government physician at Pine Ridge Agency 1890–3, being Indian secretary of the Y. M. C. A. 1894–7. He acted as attorney for the Santee Sioux at Washington 1897–1900, was government physician at Crow Creek, South Dakota 1900–3, and since 1903 has been revising the Sioux family names. He published *An Indian Boyhood: or Recollections of a Wild Life* (1901); *Red Hunters and the Animal People* (1904).

EASTMAN, Charles Rochester, American palæontologist: b. Cedar Rapids, Iowa, 1868, June 5. He was graduated at Harvard University in 1890. Subsequently he served on the United States and Iowa State geological surveys; and was an instructor in geology and palæontology in Harvard and Radcliffe colleges. He afterward took charge of the department of vertebrate palæontology in the Agassiz museum at Harvard. He published an English translation of Von Zittell's *Palæontology* (1901). In 1901 he was tried for the murder of his brother-in-law, and acquitted.

EASTMAN, George, American inventor: b. Waterville, Oneida co., N. Y., 1854, July 12. As an amateur photographer in Rochester, N. Y., he turned his attention to the production of dry plates, which achieved an instantaneous success. In 1881 the Eastman Dry Plate Company was organized, which developed later into the Eastman Kodak Company. Eastman companies have also been established in London, Paris, Berlin, and elsewhere, and the business has now reached vast proportions.

EASTMAN, John Robie, American astronomer: b. Andover, N. H., 1836, July 29. He was graduated at Dartmouth College in 1862; and became assistant in the United States Naval Observatory. In 1865 he was appointed professor of mathematics in the navy. He has been a member of several astronomical expeditions in the United States, and accompanied one to Sicily in 1870. Most of his observations, computations, and researches appear in the annual volumes of the *Naval Observatory*, which, in 1872–82, were edited by him. He wrote *Transit Circle Observations of the Sun, Moon, Planets, and Comets* (1903).

EASTON, *ēst'on:* city and capital of Northampton co., Pa., on the Delaware river at its confluence with the Lehigh river, and on the Pennsylvania, the Lehigh

Valley, the Central of New Jersey, Delaware, Lackawanna & Western, and other railways; 67 m. n. of Philadelphia and 75 s.w. of New York. It has water communication with the latter and with Newark by the Morris and Essex canal, and with Philadelphia and the coal regions by the canals of the Lehigh Coal & Navigation Company. Before and during the War of the Revolution 'the forks of the Delaware,' as the place was then called, was an important frontier outpost. It was here that David Brainerd (q.v.) began his missionary labors among the Indians after 1742, and many important conferences with the Indians were held here and treaties made. The Reformed Church in N. Third street was the scene of one or more of these conferences, and it was used as a hospital by the patriots during the struggle for independence. At the corner of Ferry and Fourth streets stands the home of George Taylor, a signer of the Declaration of Independence. In 1779 General John Sullivan (q.v.) set out from here with his expedition against the Iroquois. A town was laid out in 1750, it became a borough in 1789, but was not chartered as a city until 1887. South Easton was annexed in 1898. Many of the residences in this section antedate the Revolution; but the newer residence districts are on the surrounding hills. The adjacent scenery is remarkably beautiful; handsome bridges for railway and general traffic connect the city with Phillipsburg, N. J., on the opposite side of the Delaware and with the former South Easton across the Lehigh river. Lafayette College (q.v.), founded in 1832, with its beautiful grounds and buildings, overlooks the city from a high bluff, and is approached by stairways and winding driveways.—An abundance of iron ore and fluxing limestone in the vicinity, and its proximity by easy communication with the anthracite coal fields, have from an early date made Easton an important center for the manufacture of iron. It has several large blast furnaces, rolling mills, foundries, and manufactories of sheet-iron, wire, and wire-rope. Building stone, slate, burning lime, and talc are quarried extensively; and in recent years the place has become an important distributing center for the great New Jersey-Pennsylvania cement belt, some of the largest cement works in the world being located within a few miles radius of the city. It has also extensive silk mills, and manufactories of compressors and drills, railway supplies, chemicals, boots and shoes, organs, etc.; flour, saw and planing mills; furniture factories, machine shops, and other industrial institutions. It has good banking facilities, daily and weekly newspapers, and an excellent public school system. It is governed by a mayor and city council elected for three years, the council being composed of two houses. The city operates its own electric light plant, and has gas and electric service, high-pressure water service, furnished largely from springs, and an excellent sewerage sys-

tem. It has a good local street railway system, and is connected by electric lines with Philadelphia and the slate and cement region along the southern slope of the Blue Ridge mountains, near the Delaware Water Gap. Pop. (1900) 25,238; (1910) 28,523.

EASTON, *ēst'on*, JAMES: b. Hartford, Conn.: soldier of the Revolution. He learned the builder's trade, and after working some time in Litchfield, Conn., removed to Pittsfield, Mass., 1763, raised a regt. for the revolutionary army in Berkshire, 1775; commanded it at Ticonderoga; conveyed the news of that battle to the provincial congress; advocated the invasion of Canada and commanded a regt. there under Gen. Montgomery till 1776; and then, after spending his whole fortune in the service and receiving the thanks of congress for his active patriotism, was forced by the jealousy of Benedict Arnold to resign from the army. He returned to Pittsfield broken-hearted and died in extreme poverty.

EAST ORANGE: city of Essex co., N. J.; on the Del., Lack. & West. railroad, and a branch of the Erie railroad, also on the Newark and Orange street railway; 3 m. w.n.w. of Newark, 12 m. w. of New York. It is on the e. boundary of the city of Orange and has an area about double that of the city. Its streets are broad, straight, and bordered with handsome shade trees. More than 60 miles of well-kept macadam and Telford roads traverse the city and afford delightful drives of many miles. The city is almost wholly a place of permanent and summer residence, and being a favorite with people of wealth, its buildings present a rich variety of architectural fancies. The residences are in general surrounded with spacious grounds, and there are many fine specimens of landscape gardening. The municipal government is administered by a mayor and city council, elected biennially; the boards of education and assessors are chosen by popular vote, the other municipal officers being nominated by the mayor with the consent of the council. The city is well lighted with gas and electricity, and it has a number of handsome public school buildings and churches. Until 1863 it was a part of the city of Orange, but it was that year incorporated as a separate borough; and in 1899 it was chartered as a city. Its healthful and pleasant location, at the foot of the Orange mountains, and its accessibility to New York, have given it a rapid growth. Pop. (1910) 34,371.

EASTPORT, *ēst'pōrt:* city and port of entry in Washington co., Maine, on Moose Island in Passamaquoddy Bay, and on the Washington County railroad; 190 m. n.e. of Portland. It is connected with the mainland by a bridge across the narrow channel of the bay. Eastport is the frontier city of the United States on the northeast, and has a fine harbor. There is daily steamship service with Boston, Portland and Calais. The city has extensive shipping and fishing interests, and is the center of the American sardine-canning in-

dustry, with 20 separate establishments; it also manufactures shoes, box-shooks, etc. It has a custom-house, public library, the Boynton High School, churches, national and savings banks, weekly newspapers, and is lighted by electricity. The first settlement was made here about 1782, and for a long time the island on which it is situated and others in the bay were claimed by Great Britain. On the 11th of July, 1814, the town was captured by a British force, and held for about three years after the close of the war. It was noted at this time and for several years afterward as a center of the smuggling industry. Pop. 4,900.

EAST PROVIDENCE, Rhode Island: in Providence co., separated from the city of that name by the Seekonk river, and on the New York, New Haven & Hartford railroad. This place and Seekonk were formerly parts of the old town of Rehobeth, but it was separated from the former when the Massachusetts-Rhode Island boundary line was established. It was incorporated in 1862. There are chemical, electrical, and wire-works establishments in the place; also a handkerchief factory, a bleachery, and other institutions. The government is administered by a town council, which chooses a majority of the administrative officials, the remainder being elected by popular vote. Pop. (1910) 15,808.

EAST RIVER: strait connecting Long Island Sound and New York Harbor. It is 20 m. long, separating New York City on the west from Astoria, Long Island City and Brooklyn, on the east. Its narrowest part is known as Hellgate (q.v.), in the e. part of its course. Here the rocks, which once obstructed the passage, and vexed the swift current at certain times of tide into dangerous whirlpools and eddies, have been removed by blasting. The name E. R.—clearly a misnomer for an arm of the sea—is convenient as contrasted with the North River, or Hudson, and may have arisen from the river-like action of the tides—an action so powerful as to have here and there materially deepened the channel.

EAST ST. LOUIS: city in St. Clair co., Ill., on the Mississippi river, and opposite the city of St. Louis, Mo., with which it is connected by two steel bridges. It is a great railroad center, all of the trunk lines from the North, East and South converging here. It is also an important manufacturing center, these interests being promoted by valuable coal deposits in the vicinity, as well as by immunity from onerous taxation. Within a very recent period it has grown from an insignificant village to one of the important manufacturing cities of the middle west, in spite of the fact that soon after starting on its career of improvement the place was almost entirely destroyed by a cyclone. In addition to a large number and great variety of manufacturing establishments it has extensive stock-yards, a horse and mule market, and meat-packing industries. The site of the city was formerly an island, called

Bloody Island, in consequence of several duels having been fought there; and it was so low as to be subject to frequent inundations from the river; but during the past ten or twelve years more than $5,000,000 have been expended in raising the grades and improving the streets. Pop. (1900) 29,655; (1910) 58,547.

EAT, v. *ēt* [Dut. *eten;* Icel. *eta;* Goth. *itan;* Ger. *essen;* L. *ĕdĕrĕ*, to eat; Gael. *ith*, to eat]: to consume, as food with the mouth; to wear away or corrode; to gnaw; to take food. EAT'ING, imp.: N. the act of chewing and swallowing food. ATE, pt. *āt*. EATEN, pp. *ēt'n*. EAT'ABLE, a. *-ă-bl*, that which can be eaten, or is fit for food. N. anything used for food, usually in the plu. EAT'ER, n. one who. EAT'AGE, n. *-āj* [from *eat:* Fris. *etten*, to pasture]: pasturage, or the eatable growth of either grass or corn field—same as *eddish*. TO EAT ONE'S WORDS, to withdraw or retract them.

EATON, *ē'ton*, AMOS BEEBE: 1806, May 12—1877, Feb. 21; b. Catskill, N. Y.: soldier. He graduated at the U. S. Milit. Acad. 1826, served in the Seminole Indian war 1837-8, was chief commissary of subsistence of Gen. Taylor's army in the early part of the Mexican war, became brev. maj. for services at Buena Vista, was chief commissary of the dept. of the Pacific 1851-55, and at New York 1855-61, depot purchasing commissary in New York 1861-64, and commissary gen. of the subsistence bureau at Washington 1864-74. He rose to the rank of brev. maj.-gen. U. S. A. 1865, and was retired 1874, May.

EATON, DORMAN BRIDGMAN, LL.D.: 1823, June 27; 1899, Dec. 24; b. Hardwick, Vt. He graduated from the Univ. of Vt. 1848, and from Harvard Law School with high honors 1850; in the latter year began the practice of law in New York in partnership with Judge William Kent. He soon became a prominent member of the Union League Club. He travelled in Europe and carefully studied the civil service of the principal nations, was chairman of the civil service commission 1873-75, went to England 1877, was appointed civil service commissioner 1883, resigned 1885, July, but was reappointed in Nov., and resigned 1886. He drafted the laws establishing the police courts and the board of health of New York, and the National Civil Service Act of 1883. He has published *Civil Service in Great Britain*, and various other works.

EATON, EDWARD DWIGHT, D.D., LL.D.: 1851, Jan. 12, ——————; educator; b. Lancaster, Wis. He graduated at Beloit Coll. Wis., 1872, at Yale Divinity School 1875, and during the next two years studied in the universities of Leipsic and Heidelberg, Germany. He was duly ordained, and was pastor of Congl. churches at Newton, Io., 1876-80, and at Oak Park, Ill., 1880-86. In 1886-1905 he was pres. of Beloit Coll.,

Beloit, Wis. In 1898 he was one of three delegates sent to China to inspect missions, and he spent 1901-2 abroad, studying at Berlin and traveling. In 1904 he was appointed Southworth lecturer in Andover, Mass., Theological Seminary.

EATON, JOHN, Jr., PH.D., LL.D.: b. Sutton, N. H., 1829, Dec. 5: educator. He graduated at Dartmouth College 1854, taught school in Cleveland, O., 1854-56, was supt. of public schools of Toledo 1856-59, studied theology at Andover Theological Seminary 1859-61, and was ordained by the Maumee (O.) presbytery 1861, Sep. 5. The preceding month he was commissioned chaplain of the 27th O. vols. Soon afterward he was appointed brigade sanitary inspector, supt. of contrabands 1862, Nov., and gen. supt. of freedmen for Miss., Ark., w. Tenn., and n. La. 1862, Dec., and held the latter office till 1865, May 27. During this service he was commissioned col. of the 63d U. S. colored troops 1862, Oct. 2, brevetted brig. gen. of vols. 1865, Mar. 13, and appointed asst. commissioner of the bureau of refugees, freedmen, and abandoned lands 1862, May 27. In 1871-86 he was commissioner of the U. S. Bureau of Education; in 1895 became president of Sheldon Jackson College, Salt Lake City; and in 1898 was made special agent to establish the American system of public education in Porto Rico. His publications include: *History of Thetford Academy; Mormons of To-day; The Freedmen in the War* (report); *Schools of Tennessee* (report); and reports of the United States Bureau of Education.

EATON, JOHN HENRY, American statesman: b. Tennessee 1790; d. 1856. He practiced law in Nashville, and was secretary of war 1829-34, when he became governor of Florida. He was appointed minister to Spain 1836, and published a *Life of Andrew Jackson* (1824).

EATON, JOSEPH ORIEL: 1829, Feb. 8—1875, Feb. 7; artist; b. Licking co., Ohio. His merits as a painter, both of portraits and of compositions, caused his election as an associate of the National Acad. of Design; and he was an early member of the Soc. of Painters in Water-colors. Among his landscapes in oil were effective views on the Hudson river; among portraits, that of G. H. Hepworth, D.D.; and of ideal pieces, *The Greek Water Carrier* and the *Lady Godiva*. He excelled in children's portraits. In water-colors he painted *Vision of the Cross, Little Nell and Her Grandfather*, etc. He died in Yonkers, N. Y.

EATON, MARGARET L. (O'NEILL): 1796–1879, Nov. 8; b. Washington: daughter of a hotel keeper. Married first to Purser John B. Timberlake, U.S.N., and, after his death, to John H. E. 1828, who was appointed sec. war by Pres. Jackson 1829. This led to great social excitement in Washington, where severe criticism of her was current in social circles, and

caused the appointment of a new cabinet. In 1836, Mr. E. was appointed U. S. minister to Spain, and during his four years' residence at Madrid, Mrs E. was esteemed one of the most brilliant ladies of the court. She lived in Washington 1840–56. In 1856 her husband died, and in 1857 she married an Italian gentleman with whom she lived but a short time.

EATON, THEOPHILUS: 1591—1658, Jan. 7; colonial gov. of New Haven, Conn.; b. Oxfordshire, England. He was educated for commercial business, but was sent to Denmark, as an agent of the King of England, and resided there some years. He came with the Rev. John Davenport (q.v.) to Mass. 1637, and was immediately made a magistrate. But seeking a place for a new colony E. with his friends, after exploring the Conn. coast, chose the place called Quinnipiac, and settled there 1638. They contracted with the Indians for purchase of land now covering 7 townships, for which they paid 13 English coats. In 1639, with 6 others (the 'seven pillars') appointed by the people, he undertook to form a govt. for the colony of New Haven. He became the first gov. of this colony and held the office till his death. In 1643 he was one of the commissioners appointed to form the 'United Colonies of New England,' and three years later he made a proposition to the Dutch gov. (of N.Y.) Kieft, to arrange an arbitration for the purpose of settling the differences between them. In his new home E. turned from mercantile to agricultural pursuits. He, like his associates, was strict in his religious views and observances, but was exceedingly courteous and agreeable in manners. In person he was handsome and commanding.

EATON, WILLIAM: 1764, Feb. 23—1811, June 1; b. Woodstock, Conn.: soldier. He served in the revolutionary army 1780–83, graduated at Dartmouth College 1790, was clerk of the house of delegates 1791–97, and was then appointed U. S. consul to Tunis, where, after much skilful negotiation with the bey, he secured an immunity for American merchantmen from attacks by Tunisian cruisers. In 1803, he returned to the United States, was soon afterward appointed U. S. naval agent to the Barbary States, and went to Tripoli with the American squadron 1804. Early in the following year he determined to restore Hamet, a former pasha who had been driven from the throne by his brother, Jussef Caramalli, collected a force of 500 men, marched 600 m. across a desert to Derne, cap. of the richest province of the country, and, with the aid of two vessels of the American fleet, captured the city. Within a few days the bey sent an army to recapture Derne, but E. successfully resisted and prepared for a rapid and stealthy march upon Tripoli, when he received intelligence that the bey had signed a treaty of peace with the United States. On his return he was highly complimented for his services by the press, and received a grant of 10,000 acres of land from Mass., and a gold box from the king of Denmark in appreciation of his liberation of Danish captives at Tripoli. Subsequently Aaron Burr vainly endeavored to

engage him in his conspiracy, and when brought to trial E. was a strong witness against him. He d. in Brimfield, Mass.

EATON, WYATT: artist: 1849, May 6—1896, June 7; b. Phillipsburg, Can. He studied in New York at the National Acad. of Design and with Joseph O. Eaton, and in Paris with Gérome, and after spending some years in study, sketching and traveling in France and England, opened a studio in New York. He was one of the founders and the first sec. of the Soc. of American Artists, and has achieved success as a portrait and figure-landscape painter. Among his paintings are *Farmer's Boy* (1870), *Reverie* (1875), *Harvesters at Rest* (1876), *Boy Whittling*, *Portrait of William Cullen Bryant* (1879), and *Grandmother and Child* (1880).

EATON HALL, England, on the river Dee, near Chester, the two places being connected by daily steamer. The Hall is the residence of the Duke of Westminster, England's richest peer, and was designed and erected 1870-82 by the architect Waterhouse. It is a fine specimen of the neo-Gothic style, and is strictly modern in its appointments. An extensive park, stocked with herds of deer and other animals, surrounds the Hall, and the terraces and gardens, which are of great beauty, are open to visitors. A number of fine paintings, among them some noted works of Rubens, Millais, and Benjamin West, are exhibited.

EATONTON, *ē'tŏn-tŏn*, Georgia, city, capital of Putnam co., on the Central R. R. of Ga., about 68 m. s.e. of Atlanta. It is in the midst of an extensive agricultural section, where fruits and cotton predominate; and it manufactures dairy products and cotton goods. Pop. 2,000.

EAU, n. *ō*, EAUX, F. plu., EAUS, Eng. plu. *ōz* [F. *eau* —from L. *aqua*, water]: an essence or perfumed spirit EAU-D'ANGE, *-dăngzh'* [F. water of the angel]: the angelic water; an agreeable perfume distilled from myrtle-flowers. EAU-DE-BOQUET, *ō'dė-bô-kā'* [F. water from a nosegay] a compound perfume, distilled from a collection of various flowers. EAU-DE-LUCE, *ō'dė-lós'* [F. the water of *Luce*—the name of the inventor]: a strong-scented solution of ammonia rendered milky by mastic and oil of amber, used as a remedy in E. India for the bites of venomous reptiles and insects. EAU-DE-VIE [F. water of life]: see BRANDY.—See EAU-DE-COLOGNE: EAU CREOLE: EAU-DE-JAVELLE: EAU-DE-LUCE.

EAU CLAIRE, *ō-klär'*, Wisconsin, city, capital of the co. of the same name, at the mouth of Eau Claire river, and head of navigation on the Chippewa river, and on the Chicago & Northern, Wisconsin Central, and several other lines of railroad; 85 m. e. of St. Paul, and 150 n.w. of Madison. It is the principal commercial and manufacturing city in n.w. Wisconsin, and is the outlet of the great Chippewa lumber district. It has extensive water power and other natural advantages,

commands a very large trade in lumber, of which it manufactures more than 300,000,000 ft. annually. It has also extensive manufactories of linen goods, furniture, iron, machinery, shoes, etc. The city has electric street railways, electric lights, water works, a public library, a high school, the Sacred Heart Hospital, national and savings banks, daily and weekly newspapers, and a number of handsome churches and school buildings. Pop. (1900) 17,517. (1910) 18,310.

EAU-DE-COLOGNE, *ō-dėko-lōn′* [Fr. water of Cologne]: celebrated perfume, invented long ago by the Farina family in Cologne, and since manufactured chiefly by members of the same family. It is made also in France and other countries. It consists principally of spirits of wine, with numerous essential oils harmoniously mingled together, producing a refreshing and delicate scent. The recipe said to be followed in the manufactories at Cologne is 12 drops of each of the essential oils neroli, citron, bergamot, orange, and rosemary, with one drachm of Malabar cardamons, and one gallon rectified spirit. The whole is distilled together. and the condensed liquid constitutes Eau de Cologne. See PERFUMES.

EAU-DE-JAVELLE, *ō-dė-zhā-vĕl′* [Fr. water of Javelle]: a preparation of chloride of soda, which, when administered to man, is stated to act as a powerful poison on the nervous system, producing general rigidity, and even tetanic spasms. It is useful in removing stains from linen fabrics. See CHLORINE.

EAU DE LUCE, [Fr. water of Luce—the inventor]: strong-scented solution of ammonia rendered milky by mastic and oil amber; formerly a popular stimulant, and still used in the E. Indies as a remedy for bites of venomous reptiles and snakes.

EAUX BONNES, *ōbon:* fashionable watering-place of France, dept. of Basses-Pyrenees, 20 m. s.s.e. of Oloron. It stands in a narrow gorge surrounded with rocks, and consists of a street of about 30 large and well-built hotels and lodging houses. On the opposite side of the street there is an open space laid out as a shrubbery, and planted with trees; it is called the Jardin Anglais. Eaux Bonnes is much frequented for its hot sulphurous springs, four in number, used for bathing. Their temperature does not exceed 91° F. There is also a cold spring here, used for drinking. The springs are said to be very valuable for their power of checking incipient consumption, and of curing various affections of the lungs and chest. From June to October, Eaux Bonnes is crowded with visitors and patients. Pop. 900.

EAUX CHAUDES, *ō shōd,* LES: watering place in France, 3 m. s.e. of Eaux Bonnes. Its springs have the same properties as those of the Eaux Bonnes(q.v.).

EAVES, n. *ēvz* [AS. *efese,* margin, edge; *efesian,* to shave: old Dut. *ovese;* Fris. *ose,* eaves. The final *s* is often

mistaken for the sign of the plural: hence we sometimes find a fictitious singular form, EAVE]: in *architecture*, the edge of a sloping roof which overhangs the wall, for the purpose of throwing off the water. When there is no concealed gutter at the margin to conduct the water to spouts or pipes, but the water is allowed to drop from the roof to the ground, they are called *Dripping Eaves*. EAVESDRIP, or EAVESDROP [A.S. *yfesdrype*]: water which drops from a projecting roof, as distinguished from the water collected in a spout, to which the Romans gave the name *flumen*. 'The owner of a private estate,' says Kemble (*Saxons in England*, I, 45), 'was not allowed to build or cultivate to the extremity of his own possession, but must leave a space for eaves. The name for this custom was yfesdrype.' The space was regulated by the charter by which the property was held: in a charter of 868, it is limited to two ft. This Saxon custom corresponded to the well-known urban servitude of the Romans called stillicide (*stillicidium*). Similar regulations existed in Greece, and probably in all civilized countries. EAVESDROP, v. *ēvz'drŏp* [Dut. *oosdruip*, eavesdropping—*lit.*, to acquire information by drops or dribblets]: to stand under the eaves of a window, or at a door, to listen to what is being said within doors. EAVES'DROPPING, n. listening at doors or windows to what is said within. EAVES'DROPPER, n. an insidious listener; one who 'listens under walls or windows, or the eaves of houses, to hearken after discourse, and thereupon to frame slanderous or mischievous tales.'—Blackstone's *Comm.* iv. 168. Such persons are by law regarded as common nuisances: they may be indicted, and on conviction, are punishable by fine. Persons who by their conduct expose themselves to suspicion of an intention to commit this offense, may be brought before a magistrate, and required to give security for their good behavior.

EBAL: see GERIZIM AND EBAL.

EBB, n. *ĕb* [Ger. and Dut. *ebbe*, the falling back of the tide: Ger. *aben*, to fall off, to sink—connected with *evening*]: the reflux or flowing back of the tide; decline; a falling from a better to a worse state: V. to flow back, as the tide; to return, as the waters of the sea; to decay or decline. EB'BING, imp.: N. the flowing back of the tide. EBBED, pp. *-ĕbd*. EBB-TIDE, the retiring tide. EBB AND FLOW: see TIDES.

EBELIANS, n. *ĕ-bĕl'ĭ-anz* [named after *Ebel*, a Prussian archdeacon, one of the founders]: in *chh. hist.*, revivalist sect which arose in Königsberg, in Prussia, about 1836, the Archdeacon Ebel and Dr. Diestel being its leaders. They believed in spiritual marriage. In 1839 sentence was passed against their leaders, who were charged with unsound doctrine and impure lives, but it was removed in 1842.

EBENACEÆ, *ĕb-ĕn-ā'sē-ē:* nat. ord. of exogenous plants, consisting of trees and shrubs, with alternate leathery leaves, and axillary flowers, which are monopetalous, somewhat leathery, and generally unisexual; the fruit fleshy. They have not a milky juice. They are regarded as allied to

Aquifoliaceæ (holly, etc.), *Apocynaceæ*, and *Oleaceæ*. About 160 species are known, mostly tropical, but a few are natives of Europe, and other temperate countries. The wood is in general remarkable for hardness, as the different kinds of ebony (q.v.) and other species of *Diospyros;* and on account of this quality, even that of species which never attain the ordinary size of timber trees is sometimes accounted valuable, as of *Royena lucida*, the African bladder-nut or zwart-bast, at the Cape of Good Hope; where also that of *Euclea undulata*, a hard brown wood, is esteemed for cabinet-work. The fruit of many species is eatable: see DATE PLUM. The fruit of *Embryopteris gelatinifera* contains a viscid juice, and is used in all parts of India for paying boats.

EBERHARD, *ā'bĕr-hart*, or *ĕb'ĕr-hart*, AUGUST GOTTLOB: 1769–1845, May 13; b. Belzig: German author. He studied at Leipsic and Halle, and attracted attention by his contributions to a periodical devoted to *belles-lettres*, entitled *Ida's Blumenkörbchen* (Ida's Flower-basket). Among his numerous works were *List um List, oder was ein Kuss nicht vermag* (Trick for Trick, or what could not a Kiss do); *Ysop Lafleur's Sämmtliche Werke* (Ysop Lafleur's Collected Works); *Ferdinand Werner, der Arme Flötenspieler* (Ferdinand Werner, the poor Fluteplayer); and *Ischarioth Krall's Lehren und Thaten* (Iscariot Krall's Doctrines and Doings); *Hannchen und die Küchlein* (Jenny and the Chickens), a narrative poem in ten parts, which has gone through many editions, and been often translated into other languages; and *Der erste Mensch und die Erde* (The First Man and the Earth), a poem marked by simple dignity and lively representation. Eberhard died at Dresden.

E'BERHARD, JOHANN AUGUST: 1739, Aug. 31—1809, Jan. 6; b. Halberstadt: philosophical writer of Germany. He studied theology at Halle, 1756–59; and after spending several years as a preacher in Berlin and Charlottenburg, became prof. of philosophy at Halle 1778, and Doctor of theology 1808. Eberhard's first work was his *Neue Apologie des Socrates* (New Apology of Socrates), 2 vols. Berlin 1772, vindicating common sense against theological narrowness. Among his writings were *Sittenlehre der Vernunft* (Ethics of the Reason), Berlin 1781; *Theorie der schönen Künste und Wissenschaften* (Theory of the Fine Arts and Sciences), Halle 1783; *Allgemeine Geschichte der Philosophie* (Universal History of Philosophy), Halle 1788; *Handbuch der Aesthetik* (Manual of Æsthetics), 4 vols. Halle 1803–05; and *Versuch einer allgemeinen Deutschen Synonymik* (An Attempt toward a Complete Work on German Synonyms), 6 vols. Halle 1795–1802, enriched and improved by Maas, 1818–21, and again by Gruber, 1826–30, but which was, at its appearance, the best work of the kind in the German language. Toward the close of his life, Eberhard struggled, but without success, against the speculative excesses of the new schools of philosophy headed by Kant and Fichte. Eberhard was a clear and

sensible thinker, as well as an agreeable and interesting writer.

EBERNBURG, *ā'bėrn-bûrċh:* small town in the Bavarian Palatinate, about 20 m. s.w. of Mayence, at the junction of the Alsenz with the Nahe. It is notable for the ruins of its castle, which formerly belonged to the famous knight Franz of Sickingen, a devoted friend of the early reformers. His stronghold, formerly considered almost impregnable, afforded a secure retreat from danger and persecution to Melanchthon, Bucer, Œcolampadius, and Ulrich von Hutten, the last of whom composed several of his works here. After the death of Sickingen, the castle of Ebernburg was besieged and dismantled by the Electors of Hesse and of Treves. Pop. about 500.

EBERS, *ā'bėrs,* Georg Moritz: b. Berlin, 1837, Mar. 1; d. 1898, Aug. 8: Egyptologist and novelist. He studied law at Göttingen, took up the subject of Egyptology at Berlin, and recovering from a long illness, established himself as a lecturer at Jena, where 1868 he was made professor. Next year he made a long journey in Egypt and the East, and in 1870 was called to Leipsic. In 1872, again in Egypt, he discovered the famous *Papyrus Ebers,* an ancient Egyptian medical treatise. He was paralyzed in 1876, and enforced inaction induced him to resume historical novel-writing. His works include *Uarda* (1877); *Homo Sum,* which he considered his best work (1878); *The Sisters* and *An Egyptian Princess* (1880); *The Emperor* (1881); *Only a Word* (1883); *Serapis* (1885); *The Bride of the Nile* (1886); *Margery* (1889); *The Elixir and Other Tales* (1890); *The Thorny Path* (1891); *The Story of My Life* (1893); *Cleopatra* (1894). His *Egypt, Descriptive, Historical, and Picturesque* (2 vols.) appeared 1880.

EBERT, *ā'bĕrt,* Karl Egon: Bohemian poet; b. Prague, 1801; d. 1882: for many years a librarian at Donaueschingen. He has written lyrical, epical, and dramatic poems, the most noteworthy separate works being *Wlasta* (1829), *Das Kloster, Fromme Gedanken,* and *Am Bergsee* (1879). His poems are marked by lyrical vehemence and elegance of language.

EBIONITE, n. *ē'bĭ-ō-nīt* [Heb. *ebionim,* the poor]: one of a heretical body of Jewish Christians in the very first age of the Church. The name was probably given originally by the hierarchical or influential party among the Jews, to those of their countrymen who professed the Christian faith, and who generally belonged to the *poorer* and more ignorant class (John, vii. 48, 49). Subsequently, it seems that the Gentile Christians, ignorant of Hebrew, employed it in a distinctive sense to designate their Jewish co-religionists, who, in addition to their belief of Christianity, observed the Mosaic law. Irenæus is the first writer who makes use of the name. It is highly probable that the Ebionites became an organized body or sect, first at Pella, a city in Peræa, on the e. side of the Jordan, whither they had betaken themselves on the breaking out of the Roman-Jewish war in the time of Hadrian. Here, indeed, a strictly

Jewish-Christian church continued to exist till the 5th c. Among the Ebionites, however, there was no unanimity of religious feeling, or uniformity of opinion. Two great divergent parties are clearly recognizable—the Ebionites, proper, and the Ebionitic Nazarenes. The former were little different from Jews: their conceptions of the Savior were meagre and unspiritual. They believed that Jesus was simply a man distinguished above all others for *legal* piety—pre-eminently a *Jew*, and selected as the Messiah because of his superior Judaism. Of course they denied his supernatural birth, yet not his resurrection; for 'they lived in expectation of his speedy return to restore this city of God (Jerusalem), and to re-establish the theocracy there in surpassing splendor.'—*Neander*. They were the genuine descendants of those Judaizers who plagued the church in the time of the Apostle Paul, and with whom he reasons in his epistle to the 'foolish Galatians.' The Ebionitic Nazarenes, on the other hand (who at the close of the 4th c. seem to have dwelt chiefly about Berœa, in Lower Syria, but at an earlier period may have been more widely diffused), were Jewish Christians, in the better sense. They conceived it to be their *own* duty still to circumcise, keep the Sabbath, etc., but they had no wish to impose the peculiarities of Judaism on the Gentile Christians They did not believe that Christianity was merely a glorification of Judaism, but a new life come into the world, in which the Gentile might at once participate, without undergoing a Mosaic ordeal. Like the stricter Ebionites, they used a *Gospel of Matthew;* but it contained what the other did not —an account of the supernatural conception and birth of the Savior. According to Neander, who has thoroughly investigated this question, there were a great many varieties of opinion among the E., springing out of the differences above spoken of, which it would be profitless to trace. It is sufficient to say that *Essenism* (q.v.) modified Ebionism greatly, through the introduction of a Jewish mysticism, which recognized in Moses and Christ an inward identity of doctrine, and regarded them as revealers of the 'primal religion,' whose teaching, however, had been sadly corrupted. It is extremely probable that an Essenic Ebionite wrote the *Clementine Homilies*. See CLEMENS.

EBLANINE, n. *ĕb'la-nĭn* [etym. doubtful]: in *chem.*, a volatile crystalline spirit, obtained from crude pyroxylic spirit.

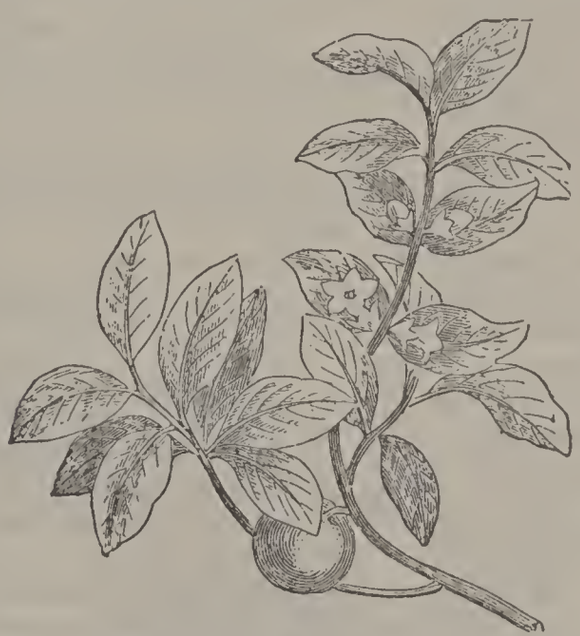
EBOE, n. *ē'bō* [W Indian word]: the name given in the W. Indies by planters and others, to the slaves brought from the Bight of Benin, who were a sickly, despondent race: ADJ. pertaining to the Eboes or their country. EBOE-TREE, n. in *bot.*, *Dipterix eboensis*, large tree with heavy timber, growing in the Mosquito country in Central America. The natives use the oil for anointing their hair.

EBOLI, *ā'bō-lē* (ancient *Eburi*): small town of s. Italy, in the Principato Citeriore, about 16 m. e.s.e. from Salerno; picturesquely situated at a considerable elevation above sea-level. The climate, which does not become too cold in

winter, notwithstanding the position of the town, is very unhealthful in summer, owing to the number of streams in the neighborhood. There is an annual fair at E., which lasts 12 days. Pop. 8,405.

EBONITE, n. *ĕb'on-īt* [Eng. *ebony*]: name given by Mr. Goodyear to what is generally known as hard rubber. It is a vulcanite with a large proportion of sulphur and several other ingredients. Notwithstanding its name it sometimes resembles bone, wood, horn, ivory, etc. It is called also vulcanite.

EBONY, n. *ĕb'ŏn-ĭ* [F. *ébène*—from L. *ebĕnus;* Gr. *ebĕnos*, the ebon-tree: It. *ebeno*]: a wood remarkable for its hardness, heaviness, and deep black color, the black duramen or heart-wood of different species of *Diospyros*, of the nat. ord. *Ebenaceæ*, the same genus which produces the date plum (q.v.), kaki, and other fruits. The best E., excelling in uniformity and intensity of color, is the produce of *D. Ebenum*, which grows in great abundance in some flat parts of Ceylon, and is a tree of such magnitude, that logs of its heart-wood, two ft. in diameter, and 10 to 15 ft. in length, are easily procured. *D. melanoxylon*, the



Ebony (*Diospyros Ebenum*).

E. tree of Coromandel, yields E. of good quality; *D. tomentosa, D Roylei*, and other Indian species, also yield it. In Mauritius and Madagascar, E. of very good quality is produced by *D. reticulata*. Other species of *Diospyros* are much valued for their beautiful timber, very different in color from E., as calamander-wood (q.v.) and cadooberia (*Diospyros Ebenaster*). The last-named species is found in India and Ceylon. The prevailing black of the wood is beautifully striped with a rich yellowish-brown; but in density and durability it is far inferior to ebony.—E. is used by cabinet-makers chiefly for veneering. The ancient Greeks and Romans were acquainted with it; and it is sup-

posed that they obtained it either from India or Madagascar. They frequently inlaid it with ivory, for contrast of color. It is mentioned by Ezekiel (xxvii. 15) as an article of Tyrian commerce. It was at one time used in medicine, as a laxative and sudorific; it has a somewhat pungent taste.—The name E. is sometimes given to the black wood of trees very different from those of the genus *Diospyros*. An Abyssinian tree called Mozzungha (*Fornasinia*), of the order *Leguminosæ*, produces a black heavy wood, much resembling ebony.—West Indian E. or American E. is produced by *Brya ebenus*, also of the nat. ord. *Leguminosæ*, but the wood is of a greenish-brown rather than a black color. It receives a good polish, is very hard and durable, and much sought after by musical instrument-makers. It is one of the articles of export from the W. Indies. But the tree is or small size, seldom more than 12 ft. high, and the trunk only a few inches in diameter. Ebony, a. like ebony; black. Eb'onize, v. *-īz*, to make black. Eb'oniz'ing, imp. Eb'onized, pp. *-īzd:* Adj. made to resemble ebony. Ebon, a. *ĕb'ŏn*, of or like ebony; black. Ebonite, n. *ĕb'ŏn-īt*, a name for vulcanite, or vulcanized India-rubber, from its dark color—made of caoutchouc and sulphur.

EBOULEMENT, n. *ĕ-bōl'-mĕnt* [F. *ébouler*, to fall down]: the falling down or crumbling away of the walls of a fortress; in *geol.*, a sudden fall or slip of rock in a mountainous district.

EBRACTEATE, a. *ē-brăk'tĕ-āt*, or Ebrac'teated, a. *-tĕ-ā-tĕd* [L. *e*, from; *bractĕă*, a thin layer of wood]: in *bot.*, without a bract or floral leaf.

EBRACTEOLATE, a. *ē-brăk'tĕ-ō-lāt* [L. *e*, without; *bracteola*, a thin leaf of gold]: in *bot.*, destitute of bracteoles; not having small or secondary bracts

EBRIETY, n. *ĕ-brī'ĭ-tĭ* [F. *ébrieté*, drunkenness—from L. *ebrĭĕtātem*—from *ebrĭŭs*, drunken]: intoxication; drunkenness: also Inebriety, in same sense, which see.

EBRILLADE, n. *ĕ-brĭl'lād* [F.]: a check of the bridle which a horseman gives by a jerk of one rein, when the horse refuses to turn.

EBRO, *ē'brō* (Lat. *Iberus*): important river of Spain. It rises in the province of Santander, at a great elevation above the sea; about 12 m. n.w. of Reynosa, flows s.e for about 25 m.; then e. past Frias, after which it maintains a general s.e. course, passing Miranda, Haro, Logroño, Tudela, and Zaragoza, when it turns n., passes Mequinenza, flows s.e. to Mora, s. to Tortosa, and finally e. to the Mediterranean; length abt. 540 m. Its mouth is choked with sand, and, to render it navigable, a canal called the San Carlos has been carried through the delta. Its principal affluents are the Najerilla, Jiloca, and Guadalope from the right, and the Aragon, Gallego, and Segre from the left. The course of the E. is chiefly through narrow, and sometimes rocky valleys; and its bed is characterized by many shoals and rapids which interrupt the navigation. This is partly remedied, however, by means of the Imperial Canal, from the vicinity of Tudela to 40 m. below Zaragoza

EBULLITION, n. *ĕb'ŭl-lĭsh'ŭn* [OF. *ebullition*—from L. *ebullitiōnem*—from *ebullĭō*, I boil or bubble up—from *e*, out; *bulla*, a bubble]: the boiling of liquids; the agitation or bubbling up of a liquid, caused by particles of it being changed into steam; effervescence; an outward display of feeling, as of anger. EBULLIENT, a. *ĕ-bŭl'yĕnt*, boiling over. EBUL'LIENCY, n. *-yĕn-sĭ*, a boiling over. EBUL'LIOSCOPE, n. instrument for ascertaining the strength of distilled liquors by an observation of their boiling-point and the atmospheric pressure.—SYN. of 'ebullition': a boiling; ferment; fermentation; exhilaration.

EBURNA, n. *ē-bĕr'na* [L. *eburnĕŭs*, of ivory]: ivory shell, genus of mollusks, family *Buccinidæ*. The shell when young is umbilicated; when adult the inner lip is callous, spreading, and covering the umbilicus; the operculum is pointed. Fourteen species are known from the hotter parts of the e. hemisphere.

EBURNEAN, a. *ĕ-bĕr'nĭ-ăn* [L. *eburnĕŭs*, pertaining to ivory—from *ebur*, ivory]: made of ivory. EBURNATION, n. *ē'bĕr-nā'shŭn*, in *med.*, the excessive deposition of osseous matter in certain diseased states of bones.

EBURNINE, a. *ē-bĕr'nīn* [L. *ebur*, ivory; Eng. suff. *-ine*]: of or belonging to ivory.

EC, prefix, *ĕk* [see EX]: *ex* becomes *ec* before *c*.

ECALCARATE, a. *ē-kăl'kĕr-āt* [L. *e*, without; *calcar*, a spur]: in *bot.*, without a calcar or spur.

ECARINATE, a. *ē-kăr'ĭ-nāt* [L. *e*, without; *carina*, a keel]: in *bot.*, without a carina or keel.

ÉCARTÉ, *ā-kâr-tā:* game of cards, usually played by two persons, but sometimes by three, the third player taking the place of the loser of the first game. Before shuffling, all the 2, 3, 4, 5, and 6-spots are removed; the deal is decided by cutting at the beginning of each game; and the lowest card, the ace, deals. The game consists of 5 points, unless otherwise agreed on; and two packs are commonly used alternately to prevent the possibility of the place of particular cards being remembered. The cards are dealt 3 at a time to each player, and then 2, or *vice versa;* the 11th card is turned up on the pack and is the trump. When the king of any suit is a trump, the dealer scores a point Both the non-dealer (first) and the dealer have the privilege of exchanging any or all of the cards in hand if dissatisfied with them; a second deal is made from the top of the talon in the same manner as the first. If the dealer refuse to exchange any cards, the non-dealer scores double for the points he may make, except in the case of turning up a king trump; and if the non-dealer plays without proposing, the dealer scores double for the points he may make. Discarding may proceed as long as there are cards in the talon, if both parties agree, but when either party is satisfied with his hand the other must stop changing. The non-dealer names the suit he intends to lead and begins the play; his opponent is obliged to take the trick if he has a winning card of the suit led, but need not trump it unless he wishes. The

holder of the king of trumps must declare it before he plays, or, if he leads it, may declare it after the play, but if his opponent covers it before his declaration he loses his score on it. As in other games the trump and the highest card of the suit led win the tricks. The winner of the first trick leads for the second, and the playing goes on, very much like that in the game of euchre, till the 5 tricks are played. A player must win 3 tricks to score 1 point, and 5 tricks to score 2; and it is possible for a player to score a game in a single hand.

ECAUDATE, a. *ē-kaw'dāt* [L. *e*, without; *cauda*, a tail]: in *zool.*, without a tail; in *bot.*, spikeless; without a stem.

ECBALIUM, n. *ĕk-băl'ĭ ŭm* [Gr. *ekballō*, I throw out, with reference to the fact that the seeds when ripe are expelled from the fruit with considerable force]: in *bot.*, genus of *Cucurbitaceæ*. *E. agreste*, sometimes called *Momordica Elaterium*, is the squirting cucumber.

ECBASIS, n. *ĕk'ba-sĭs* [Gr. *ek*, out; *baino*, I go]: in *rhet.*, figure of speech in which the speaker treats of things according to their events and consequences. ECBATIC, a. *ĕk-băt'ĭk*, in *gram.*, relating to a result, issue, or consequence. It is opposed to telic which denotes purpose or intention.

ECBATANA, *ĕk-băt'a-nâ* (Agbatana, Achmĕta, Hagmatana): ancient capital of Media; 12 stadia (about 1½ m.) from Mount Orontes, the modern Elwend. Its foundation was attributed by popular belief to Solomon or Semiramis, while the book of Judith ascribes it to Arphaxad (Phraortes?), and Herodotus to Deioces (B.C. 728). It was upon a conical hill, crowned by a temple of the Sun, and was enclosed by seven concentric walls, the innermost of which was gilded, and the next plated with silver; while the rest, in their order outwards, were painted orange, blue, scarlet, black, and white, respectively. As they rose in gradation toward the centre, all the battlements with their gorgeous hues—probably representing, in Sabæan fashion, the seven planetary spheres or the seven climes—were visible at once. The city is reported to have been 250 stadia in circumference. Its principal buildings were the citadel—a stronghold of enormous dimensions, where also the archives were kept, in which Darius found the edict of Cyrus the Great concerning the rebuilding of the temple in Jerusalem—and the royal palace. Cedar and cypress only were used for the woodwork, and the ceilings, beams, and rafters were overlaid with gold and silver. The mild climate and the magnificence of its structure singled out E. as the favorite summer residence, first of the Median, then of the Persian, lastly of the Parthian monarchs. After the battle of Arbela (B.C. 331), Alexander followed Darius thither, and secured an immense booty. It was again pillaged by the Seleucidæ; but such were the riches of this place, that Antiochus the Great still found 4,000 talents' worth of silver to carry away. E. subsequently fell into the hands of the Parthians; and it has since so utterly sunk into decay, that notwithstanding the frequent mention of it both in the Bible and

in classical writings, its very site can no longer be fixed with certainty. Gibbon and Jones tried to identify it with Tabriz or Tauriz; Williams, with Ispahan; while recent explorers, such as Rennell, Mannert, Kinneir, Morier, and Ker Porter, generally agree that the present Hamadan, with the supposed tombs of Mordecai and Esther (see HAMADAN), occupies the site of ancient Ecbatana. Sir Henry Rawlinson assumes two Ecbatanas, one the present Hamadan, the other the present Takhti-Suleiman, 36° 25′ n. lat., 47° 10′ w. long. Both the orthography of the scriptural Achmĕta, and the cuneiform Hagmatana in the Behistun Inscriptions, which, by changing the *m* into *b*, became Agbatana in Greek, seem to point to Hamadan. Broken columns, a few cuneiform inscriptions, coins, medals, and a fragmentary stone lion, placed there, according to the Eastern legend, by the sorcerer Apollonius of Thayne at the command of Nebuchadnezzar, in order to guard the town from excessive cold and snow—all dug out near Hamadan—are all that remains of that once most royal of cities. There was another ECBATANA in Persis, which was given to the Magi; and a third in Syria, at the foot of Carmel, the present Kaïffa, where Cambyses, the son of Cyrus, suddenly died, B.C. 520.

ECBLASTESIS, n. *ĕk-blăs-tē′sĭs* [Gr. *ekblastanō*, I shoot or sprout out]: in *bot.*, production of buds within flowers. or on inflorescences, in consequence of monstrous development.

ECBOLE, n. *ĕk′bŏ-lē* [Gr. *ek*, out; *ballo*, I throw]: in *rhet.*, digression, in which the speaker introduces another person speaking in his own words; in *mus.*, the sharpening of sounds to adapt them to a change of key-note.

ECCALEOBION, *ĕk-ka-lē-ō′bĭ-on:* incubator; or contrivance by which eggs are hatched by artificial heat. It consists of a block-tin or sheet-iron oven, supplied with a number of shelves on which the eggs are placed so that they may be turned daily till hatched. The heat which is maintained at a uniform temperature is derived from steam or hot water that circulates in pipes at the bottom of the oven. See INCUBATION, THE PERIOD OF.

ECCEDENTE, a. *ĕk-sā-dĕn′tā* [It.]: in *mus.*, exceeding; augmenting; a term applied to intervals.

ECCE HOMO, *ĕk′sĕ hō′mō* [L. *eccĕ*, behold; *hŏmō*, the man]: painted representation of Christ crowned with thorns, as at the time Pilate said 'Behold the man.' On this exalted subject the highest efforts of art have been employed. The finest 'Ecce Homo' is that of Correggio, in the National Gallery, London; the whole conception of this remarkable picture is of the first order of genius. Other conceptions have been painted, such as the well-known one by the great artist Guido Reni.

ECCENTRIC, n. *ĕk-sĕn′trĭk*, or ECCEN′TRICAL, a. *-trĭ-kăl* [OF. *eccentrique*, out of the centre—from mid. L. *eccentrĭcŭs*—from L. *ex*, out of; *centrum*, centre—*lit.*, out of the

centre or usual manner]: odd; singular; departing from the usual course; not having the same centre: N. a circle not having the same centre as another. ECCENTRIC, in machinery (now frequently EXCENTRIC), wheel having its axis out of the centre: contrivance for taking an alternating rectilinear motion from a revolving shaft. It consists of a circular disk or pulley, fixed on a shaft or axis which does *not* pass through the centre of the disk. The right-hand

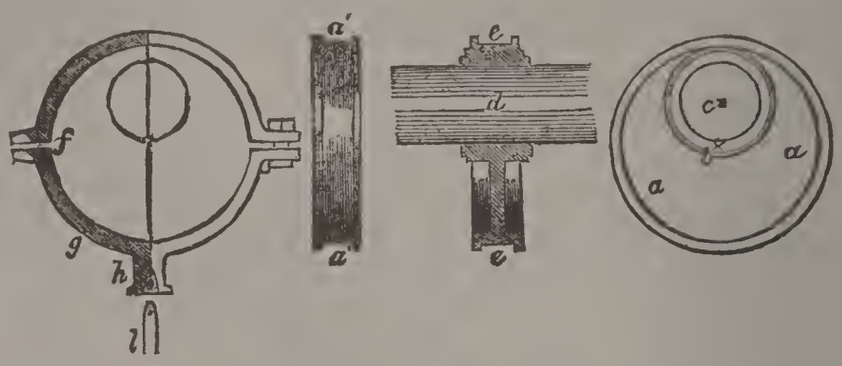
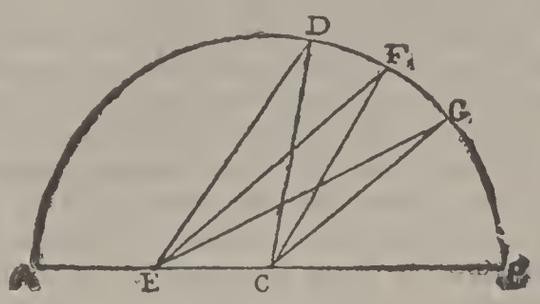


figure of the cut represents a side-plan of an eccentric; *aa* the disk, the centre of which is at *b*; the inner circle is the shaft with its centre at *c*; *ee* is a section along the axis of the shaft *d*; and *a'a'* an edge view. A hoop, *gf*, embraces the groove *a'a'*, allowing the disk to turn within it. As the eccentric revolves with the axis, the hoop is alternately raised and lowered, and with it the rod *l*, which is keyed into it at *h*. The extent of the rise and fall of the rod is equal to twice *cb*, the distance between the centres. The eccentric is used chiefly where a subsidiary motion of small power is required; as for working the force-pump that supplies the boiler of a steam-engine (q.v.). ECCENTRIC, or ECCENTRIC CIRCLE, a supposed orbit in the Ptolemaic astronomy. It was a fundamental doctrine with the ancient astronomers, that every heavenly body moved in a circle (the perfect figure), and at a uniform rate. To move otherwise than uniformly and in the perfect figure, would have been unbecoming a heavenly body! But some of those bodies appeared to misbehave by moving unsteadily, and in other figures than circles. Of course this must be a mere deceptive appearance; but then, to save the fundamental doctrine, it must be explained. To explain it, they invented the *eccentric* circle. Suppose a body, such as the sun, to move in a circle ADB at a uniform rate, and a spectator to observe it, not from C, the centre of the circle, but from E. Then, if the sun's movement in a given time be from D to F, and in an equal interval thereafter be from F to G, a spectator at C would observe these movements as being circular and made in equal times, because at C, DF and FG, being equal, subtend equal angles. But if the spectator, instead of being at C, be at E, then, as the angles DEF, FEG are unequal, the sun's motion will not appear to be uniform, nor will its path appear quite circular. If, then, the earth, instead of being at the centre of the sun's orbit, be in position away from it, the want of regularity in its movements will be explained. It will

appear to describe unequal spaces in equal times. Accordingly, to reconcile the observed fact with the fundamental doctrine, the ancients placed the earth at E, a point away from the centre of the sun's supposed orbit. Hence this orbit was called the *Eccentric*, in respect that its centre did not coincide with that of the earth, which was considered as the centre of the universe. Eccen'-trically, ad. *-lĭ*. Eccentricity, n. *ĕk'sĕn-trĭs'ĭ-tĭ*, the being odd or singular: in *mechanics* and *astronomy*, deviation from a centre; the distance of the centre of a planet's orbit from the centre of the sun. See fig. Eccentric



Eccentric Circle.

Circle. In such a figure as the eccentric circle, the eccentricity is the ratio of EC to the radius. In the ellipse and hyperbola (q.v.), the eccentricity is the ratio of half the distance between the foci to the semi-major axis. The eccentricity of the parabola is 1; that of the circle is 0. Eccentric-chuck, n. a chuck attached to the mandrel of a lathe, and having a sliding piece which carries the centre. By its means circular lines of varying size and eccentricity may be produced, but no oval or eclipse. Eccentric-cutter, n. a cutting tool placed upon the slide-rest, and having a rotation by means of a wheel and shaft, the cutter being attached to the end of the latter. The rotation is obtained by an overhead motion, and the eccentricity by fixing the cutter at different distances from the centre by means of the groove and screw. The action of the eccentric-cutter differs from that of the eccentric chuck in this: in the latter the work is rotated and the tool is stationary; in the former the work is stationary and the tool revolves. When the two motions are used in conjunction the patterns are capable of almost unlimited variation. Eccentric-engraving, n. an arrangement of diamond tracers, operated by elaborate machinery, acting upon a varnished roller designed for calico-printing. The effect is like that produced by the rose-engine lathe. Eccentric-fan, n. a fan-wheel with radial arms and vanes, and having an axis which is eccentric with the case in which it revolves. The case has a scroll form, and the effect is to make the discharge of air more perfect and avoid carrying a body of air around between the vanes. Eccentric-hook, n. in *steam-eng.*, a hook used to connect the eccentric rod with the wrist on the lever of the rock-shaft which actuates the valve; otherwise called a Gab. Eccentric-hoop, n.

the strap on the eccentric of an engine. ECCENTRIC-PUMP, n. a hollow cylinder in which is a revolving hub and axis eccentrically arranged. On the hub are flaps which act as pistons in the space between the hub and the case to expel the water, which enters at one opening and flows out by another. The same construction is seen in rotary steam engines with this difference, that in one case the shaft revolves to force water, and in the other the steam passes through to drive the shaft ECCENTRIC-STRAP, n. in *mach.*, the ring inclosing an eccentric sheave and connecting by a rod to the object to be reciprocated, as the slide valve of a steam-engine. *Note.*—ECCENTRIC is applied to 'strangeness of manner or conduct,' though strictly meaning 'out of the centre,' or applied to a body whose centre of motion does not correspond with its centre of form; in the latter sense the spelling is now usually excentric; while the spelling eccentric is restricted to the metaphorical sense.—SYN. of 'eccentric, a.': strange; anomalous; irregular; particular; whimsical.

ECCE SIGNUM, *ĕk'sē sĭg'nŭm* [L.]: behold the sign, proof or badge.

ECCHYMOSIS, n. *ĕk'ĭ-mō'sĭs* [Gr. ek, out of; *chumos*, juice, sap—from *chŭō*, I pour out]: discoloration of the skin, livid spots or blotches produced by blood effused below, or in the texture of, the skin. It is usually attended by swelling to a greater or less extent, and is the result of injury, as in a 'black eye.' The presence of ecchymosis is sometimes adduced in courts of law as a proof of violent injuries having been inflicted during life, or very shortly after death. Ecchymosis may sometimes be diminished by applying cold cloths or a bladder of ice to the surface, in the case of injuries quite recently inflicted.

ECCLES, ROBERT GIBSON, American chemist: b. Scotland, 1848, Jan. 1. He came to the United States in 1862 and became chemist in the Bureau of Indian Affairs; and professor and dean in the Brooklyn College of Pharmacy. He has discovered calycanthic acid and the alkaloids calycanthine, glaucusine, etc. and devised the official method of assaying pepsin and investigated the effects of drugs on peptic digestion. He also exposed numerous fraudulent medicines, among them the Scotch oats essence. He has written more than 100 articles on philosophic and scientific subjects.

ECCLESIA, *ĕk-klē'zĭ-â* [Gr. from *ĕkklētŏs*, called out—from *ĕk*, out of, and *kālēō*, I call]: name given by the Greeks to an assembly of persons called out for any purpose from their homes. I. At. Athens, Sparta, and other cities, it was applied specially: 1. To the assembly of free citizens, called to consider and vote upon public affairs; 2. To a larger assembly, representing an alliance of several cities or states. II. This being the common usage of the term, well known wherever the Greek language was understood, it was naturally employed in the Septuagint translation of the Old Testament to designate the assembly

or congregation of the Israelites: 'Who is there among all the tribes of Israel who came not up with the congregation [ecclesia]?' Judges xxi. 5; 'before all the congregation [ecclesias] of Israel': Josh. viii., 35; 'in the midst of the congregation [ecclesias]: Ps. xxii. 22. III. From this the transition was easy to the New Testament use of the word to denote *an assembly or company of the disciples of Christ.* (It is rendered in our English translations by the word 'church'—kirk—which comes from another Greek word—*kuriaka*—signifying *belonging to the Lord*) 1. It is applied to a small company consisting of a man's own family or friends: 'the church (company of disciples) in thy house;' 2. To a larger number, in a city or town, who hold their own religious meetings, and manage their affairs according to rules of order adopted by themselves: 'the church at Jerusalem'—'of Ephesus'—'in Smyrna.' 3. In the plural number it designates the various local Christian assemblies of a district, or province, or in general: 'the churches of Judea,' 'of Galatia,' 'of Macedonia,' 'of the Gentiles,' 'of God.' 4. It denotes the general body of believers, without restriction to place or time: 'Christ is the head of the Church': 'the church of the living God.' 5. It includes the whole company of the redeemed as the inheritors of heaven: 'the general assembly and church of the first born who are enrolled in heaven.' While this term 'ecclesia,' as setting forth a congregation or company, has been in a great degree withdrawn from the sight and thought of English readers by having been translated '*church,*' it still has a place in our language which keeps alive its relation to the church: e.g. 'ecclesiastical history,' meaning the history of the church; 'an ecclesiastic,' denoting a clerical officer; and 'the book of Ecclesiastes' is the book of the Preacher. It is noticeable, however, that *ecclesiastic* and *ecclesiasticism* have been quite turned from the New Testament reference to the church viewed as a congregation, and are used with reference to the church viewed as represented by its official members and ministers, or by a hierarchy.

ECCLESIASTES, n. *ĕk-klē'zĭ-ăs'tēz* [mid. L. *ecclēsĭăs'tĭcus*, cleric, Christian—from Gr. *ekklēsiă*, an assembly, a church: L. *ecclēsĭă*]: one of the books of the Old Testament. ECCLE'SIAS'TICUS, n. *-ăs'tĭ-kŭs*, a book of the Apocrypha. ECCLE'SIAS'TIC, n. a clergyman; a priest. ECCLE'SIAS'TIC, a. *-tĭk*, or ECCLE'SIAS'TICAL, a. *-tĭ-kăl*, pertaining to the church. ECCLE'SIAS'TICALLY, ad. *-lĭ*. ECCLE'SIAS'TICISM, n. *-as'tĭ-sĭzm*, clerical principles. ECCLESIASTICAL-MODES, n. the church modes, or the keys anciently used.

ECCLESIAS'TES [Eng. the Preacher]: title (taken from the Septuagint) of a canonical book of the Old Testament; its Hebrew name is *Koheleth*, which signifies nearly the same. The inscription with which it commences is: 'The words of Koheleth, the son of David, king in Jerusalem.' Its authorship is commonly ascribed to Solomon. In support of this opinion, however, there is not a vestige of internal evidence except what arises from the dramatic use of

his name, an expedient in all probability resorted to by the writer to give force and emphasis to his own reflections, inasmuch as Solomon was held by the Jews to be the perfection of human wisdom. The first who doubted the Solomonian authorship of the book was Grotius. Later critics have advanced further than Grotius. The actual writer probably lived, according to Dr. Davidson, in the later period of the Persian government, not long after the time of Malachi, i.e., B.C. 350–340. Such is also substantially the opinion of Rosenmüller, Knobel, Ewald, and De Wette. Hengstenberg, unquestionably one of the ablest critics of the orthodox German school, considers that the contents of the book may best be explained by supposing the author to have lived in a period like that of Malachi, in which there prevailed a pharisaical self-righteousness, and melancholy murmurings against the providence of God. The dates assigned to it by Hartmann (viz., the period of the Maccabees) and by Hitzig (B.C. 204) cannot well be sustained, as there is no trace in the book of either Grecian philosophy or language.

The chief arguments against the Solomonian authorship are *three*. 1. The writer indicates unconsciously his own posteriority in point of time by making Solomon say: 'I *was* king over Israel in Jerusalem' (i. 12); this, however, Solomon might have said during his life. 2. The condition of the country in the time of the writer, the oppression, judicial injustice, the elevation of fools and slaves to high offices, etc., do not fit the reign of Solomon at all, nor any preceding period. 3. The language is post-exilian. Ewald, one of the greatest of recent Orientalists, asserts that 'the Hebrew is so strongly penetrated with Aramæan, that not only single often-recurring words are entirely Aramæan, but the foreign influence is infused into the finest veins of the language.'—(See Ewald, Knobel, Hitzig, Graetz, Delitzsch; also Stuart and Ginsburg.)

It is difficult to ascertain the stand-point of the author. He is deeply convinced that 'all is vanity and vexation of spirit,' but whether this conviction springs wholly from a religious view of life, or is in part caused by personal disappointments, we have not sufficient internal evidence to determine. There is much in E. that, if it stood by itself, might be thought to be a mere product of cynical epicureanism, but it is mixed with so much that is nobler, with a faith in God that rises high above the crushing considerations of the vanity of all mortal life, and the book terminates so grandly, that it seems more reasonable to believe that the aim or intention of the writer was moral and religious, and not cynical; that he painted the folly, weakness, and helplessness of men in such strong colors, only that he might destroy their self-righteousness, and cure them of that inability to read the laws of God, which self-righteousness always produces. For what is the conclusion of the whole matter? 'Fear God, and keep his commandments: for this is the whole duty of man'

ECCLESIAS'TICAL COMMISSIONERS FOR ENGLAND: 'a corporation with perpetual succession and a

common seal, and with power to take, purchase, and hold, real estate, notwithstanding the statutes of mortmain.'—Burns's *Eccles. Law by Phillimore.* The Ecclesiastical Commissioners consist of all the abps. and bps. of England and Wales, the deans of Canterbury, St. Paul's, and Westminster, certain judges and cabinet ministers, with 11 eminent laymen appointed by the crown and one by the abp. of Canterbury. This Ecclesiastical Commission, permanently established 1836, has power to inquire into the revenues of bishoprics, cathedrals, etc., and to prepare and lay before the queen in council any desirable readjustments; also it has power to divide and unite parishes, and to make new districts for ecclesiastical purposes. The application of the revenues from suppressed canonries, prebends, etc., is an important part of the work of the E. C. As a corporation they are the largest landholders in England—holding about 300,000 acres, much of it the best agricultural land in the country. Net income from all sources (1888) £1,120,000 As a result of its deliberations during 25 years, two new bishoprics had been created and endowed, and a considerable number of small livings had been augmented. On the other hand, indignation has been excited by its expenditure of very large sums on the purchase and improvement of episcopal residences. The pitiful incomes of a multitude of the clergy have added keenness to the criticism.

ECCLESIAS'TICAL CORPORA'TION: in the law of England, holder of an ecclesiastical benefice. Ecclesiastical corporations are divided into aggregate and sole. An E. C. aggregate consists of several persons, as the head and fellows of a college, the dean and chapter of a cathedral, and is kept up by a continual succession of members. An E. C. sole consists of a single person and his successors in the benefice, as a bishop, a rector, a parson, or a vicar. —See CORPORATION.

ECCLESIAS'TICAL COURTS: courts specially devoted to the consideration of matters relating to the clergy, to church discipline, and to religion. The sphere, organization, and procedure of such courts are evidently different from those contemplated by the apostle Paul (I Cor. vi. 1) —'Dare any of you having a matter against the other go to law before the unrighteous [in this case heathen] and not before the saints?' The primitive companies of Christian believers plainly were not ecclesiastical courts in the modern sense, inasmuch as the apostolic injunction referring to them assigned to them no settlement of ecclesiastical matters, but only of differences in usual temporal business. Also, the question may arise in some minds whether the term 'court' is properly applied to any assembly in the church of which mention is found in the New Testament. As Christianity advanced, and was acknowledged as the revelation of the Almighty, these simple referees claimed an independent position as courts, and were suffered to exist concurrently with courts of civil jurisdiction (Code lib. i. tit. 4, *de episc. aud.*); and gradu-

ally special matters were assigned to their peculiar jurisdiction—e.g., questions of tithes, and matrimonial and testamentary causes, etc.

In Bacon's Abridgment of the Law of England, there are enumerated ten ecclesiastical courts—viz., convocation, the court of arches, the prerogative court, the court of audience, the court of faculties, the court of peculiars, the consistory court, the archdeacon's court, the court of delegates, and the court of commissioners of review. (See these several titles; also DOCTORS' COMMONS.) In 1874 a new ecclesiastical judgeship was set up, with cognizance mainly of offenses in ritual.

The chief ecclesiastical courts (Presb.) which have at various times existed in Scotland are the general assembly, the commissary court, and the court of teinds. (See ASSEMBLY, GENERAL: COMMISSARY: TEINDS.)

In dissenting denominations in Great Britain, and in all denominations in the United States, the jurisdiction of E. C. depends entirely on contract or voluntary submission. In churches organized congregationally (Bapt., etc.) the term E. C. is not in use.

ECCLESIAS'TICAL HISTORY: see CHURCH HISTORY.

ECCLESIAS'TICAL LAW: see CANON LAW.

ECCLESIAS'TICAL TITLES ASSUMPTION ACT: a law in Great Britain passed 1851, relative to a claim of ecclesiastical titles in Britain by any dignitary of the Roman Church. In 1850 a ferment of Protestant zeal was awakened by an edict issued by the court of Rome dividing Great Britain into territorial bishoprics, under an archbishop of Westminster. By the Roman Catholic party it was alleged that previous enactments struck only at the titles to existing provinces and dioceses, and that there was no prohibition against the creation of an archbishopric of Westminster. To meet this allegation, Lord John Russell introduced the Ecclesiastical Titles Bill, which was passed, prohibiting the assumption of such titles 'in respect of any places within the United Kingdom,' by any person other than the person entitled to the same. The penalty was fixed at £100 for every contravention of the act. The act allayed the fears of the country; and no prosecution under it took place. In 1871 the act was repealed as inexpedient, but with a declaration that no ecclesiastical title of honor or dignity derived from any place within the realm can be validly created except by the queen's authority. Thus, though no prosecution can now take place for assuming such titles, their assumption in Britain is still treated by the law as illegal. No opposition was made to the constitution of a Rom. Cath. hierarchy in Scotland (1878), with territorial titles.

ECCLESIAS'TICAL YEAR: see YEAR: DATE.

ECCLESIASTICUS, *ĕk-klē-zĭ-ăs'tĭ-kŭs:* apocryphal work, called in the Septuagint *The Wisdom of Jesus, the Son of Sirach.* It obtained the title of E., not because the writer was a priest (for regarding his profession nothing is known), but because it was, in the opinion of the fathers,

the chief of those apocryphal works which they designated *ecclesiastici libri* (i. e., books not inspired, but which might be read in church for the edification of the people), to distinguish them from the canonical scriptures of the Old Testament. E. was originally composed in Aramaic; and the original text was apparently extant in the time of Jerome, who states that he had seen the Hebrew, but it is now lost. The author calls himself Jesus, the son of Sirach of Jerusalem; but his date is not known. His book was translated into Greek, with an introduction by his grandson, who is usually, but not correctly, supposed to have had the same name as his grandfather. The date of the translation has been fixed as late as B.C. 130, and as early as B.C. 230. The later date is the more probable. The contents of the work are not systematically arranged, so that we can only guess at what may be called the method and purpose of the thinking. The view taken of the mercy of God as extending to all mankind, indicates that the Jewish notions were breaking up; but still there is little to show that any great spirituality was taking its place. Its tone resembles that of the book of Proverbs. Exhortations to cheerfulness are constant; medicine, agriculture, etc., are highly praised; life is regarded from an ethical rather than from a religious point of view, and consequently 'wisdom' is represented as the source of human happiness. The style of the writer is at times noble, and even sublime; and, to use the language of Addison, 'it would be regarded by our modern wits as one of the most shining tracts of morality that are extant, if it appeared under the name of Confucius or of any celebrated Grecian philosopher.'

ECCLESIOLOGY, n. *ĕk-klē'zĭ-ŏl'ŏ-jĭ* [Gr. *ekklēsiă*, a church; *logos*, a discourse]: the science of building and decorating churches; the science which investigates the development of the Christian Church in its rites of worship and government, as may be ascertained from order, architecture, arrangements, customs, and rites. ECCLE'SIOLOG'ICAL, a. *-lŏj'ĭ-kăl*, pertaining to church-building, etc. ECCLE'SIOL'OGIST, n. *-jĭst*, one who.—*Ecclesiology* is a word of recent use. Beside discriminating the various styles of ecclesiastical architecture, ecclesiology takes account of the ground-plan and dimensions of a church; of its orientation, or the deviation of its line from the true east; of its apse, or circular or polygonal east end; of its altar or communion table, whether fixed or movable, stone or wood; of its reredos, dossel, or altar-screen; of its piscina, or basin and drain for pouring away the water in which the chalice was rinsed, or the priest washed his hands; of the sedilia, or seats for the priest, deacon, and subdeacon, during the celebration of the eucharist; of the aumbrye, or locker, for the preservation of the communion vessels and elements; of the 'Easter sepulchre,' or recess for the reception of the host from Good Friday till Easter Day; of the altar-candlesticks; of the altar-steps; of the altar-rails; of the credence table, or shelf on which to place the communion elements before they were put upon the altar; of the 'misereres,' or elbowed stalls; of seats within and without the chancel walls; of the

height of the chancel as compared with the nave; of the chancel arch; of the rood-screen, rood-staircase, rood door, and rood-loft; of the piers or columns; of the triforium or blindstory; of the clerestory; of the windows; of the parvise-turret, or outside turret leading to the parvise; of the roof or groining; of the eagle-desks and letterns; of the pulpit; of the hour-glass stand, by which the preacher was warned not to weary the patience of the flock; of the reading pew; of the benches, pews, and galleries; of the aisles; of the shrine, fertour, or reliquary; of the benatura, or holy-water stoup; of the corbels, with special reference to the head-dress figured on them; of the pavement; of the belfry; of the baptismal font, with its accessories; the baptistery, the steps, the kneeling-stone, the chrismatory, the cover, and the desk; of the tower, with its lantern, parapet, pinnacles, louvres, windows, buttresses, and bells; of the porch and doors, with their niches and seats; of the parvise, or priest's chamber above the porch; of the moldings; of the pinnacle crosses; of the gurgoyles, or rain-spouts; of the churchyard or village cross; of the churchyard yew; of the lych-gate, or corpse-gate, where the corpse was met by the priest; of the crypt; of the confessional; of the hagioscope, or opening in the chancel arch through which the elevation of the host might be seen; of the lychnoscope, or low window in the side-wall of the chancel, the use of which is uncertain; of the chest for alms; of the table of the ten commandments; of the church-plate; of the faldstool, or litany stool; of the embroidered work; of the images of saints; of the church well; of the sepulchral monuments and brasses, with their inscriptions; of the chapels or sacristies; of the vestry; of the dedication crosses. Ecclesiology has a literature of its own, represented by such works as the *Handbook of English Ecclesiology* (Lond. 1847) of the 'Ecclesiological Society'; Walcott's *Sacred Archeology:* Bourassé's *Dictionnaire d'Archéologie Sacrée*, and the like.—Recently, the study of the constitution of the church also has been termed ecclesiology.

ECCOPE, n. *ĕk'kŏ-pē* [Gr. *ek*, out; *koptō*, I cut]: in *surg.*, the act of cutting out; *specif.*, a perpendicular division of the cranium by a cutting instrument.

ECCOPROTIC, a. *ĕk'kŏp-rŏt'ĭk* [Gr. *ek*, out of; *kopros*, dung]: in *med.*, promoting the discharge from the bowels.

ECCREMOCARPUS, n. *ĕk-krĕm-o-kär'pŭs* [Gr. *ekkremēs*, hanging from or upon; *karpos*, fruit]: in *bot.*, genus of *Bignoniaceæ*. *E. scaber*, native of Chili, often cultivated in other countries as an ornamental creeper. It has fine orange-colored flowers.

ECCRISIS, n. *ĕk'krĭ-sĭs* [Gr. *ek*, out; *krinō*, I select]: in *med.*, excretion of excrementitious or morbific matter. ECCRINOLOGY, n. *ĕk-krĭn-ŏl'o-jĭ*, in *physiol.*, treatise on the secretions of the body.

ECCYESIS, n. *ĕk-sĭ-ē'sĭs* [Gr. *ekkueō*, to be pregnant]: in *obstet.*, extra-uterine fetation; imperfect fetation in some organ exterior to the uterus, as in the abdomen, in one of the ovaria, or in the Fallopian tube.

ECDERON, n. *ĕk′dĕr-ŏn* [Gr. *ek*, out; *deros*, skin, hide]: in *zool.*, the outer of the two layers of that part of the skin called 'ectoderm,' corresponding to the 'epidermis' in man, into which it shows a tendency to break up.

ECDYSIS, n. *ĕk′dĭ-sĭs* [Gr. *ekdŭsĭs*, a coming out, an emerging—from *ek*, out of; *dŭō*, I enter]: the act of putting off or moulting; an emerging.

ECGONINE, an alkaloid, $C_9H_{15}O_3N$, crystallizing in lustrous prisms which contain 1 mol. of water, not shown in the above formula, and melt at 198° C. Ecgonine is closely allied to cocaine, from which it is prepared and into which it can be converted. It also has a fairly close chemical relationship, through tropine, to atropine (q.v.). Physiologically it is not of special importance.

ECHELON, n. *ĕsh′ĕ-lŏng* [F. *échelon*, a ladder-step—from *échelle;* OF. *eschele*, a ladder—from L. *scāla*, a ladder]: the position of an army or body of troops in the form of steps of a ladder; an army arranged in lines or divisions, having the right of the one bordering upon, but slightly behind the left of, the other; the several divisions of the force, though parallel, are no two on the same alignment. Each has its front clear of that in advance, so that, by marching directly forward, it can form line with it. There are two kinds of echelon, *direct* and *oblique*. *Direct* echelon is adapted for attack and retreat; while *oblique* echelon (oblique in reference to the original front of the line) is adapted for changing position, or for getting on the enemy's flank.

The word echelon is used also in reference to nautical maneuvers. A fleet is sometimes said to be arranged *en échelon;* at which time it is compared by Sir Howard Douglas to a body of infantry in a square having its diagonal parallel with the front. In other words, it presents a wedge-form toward the enemy. Under this arrangement, the bow-guns and broadsides of the several ships can mutually defend each other. Ech′elond, a. *-lŏngd*, arranged in lines like steps, or as a series of terraces or platforms one above the other.

ECHELON-LENS, n.: in *optical instruments*, a large lens, constructed in several pieces, to be put together when used. They are used in light-houses, for which it is difficult to construct lenses each of a single piece.

ECHEVERIA, n. *ĕk-ĕ-vēr′ĭ-a* [named after M. *Echeveri*, who made the drawings in the *Flora Mexicana*]: in *bot.*, genus of *Crassulaceæ*, tribe *Crassuleæ*. It has a five-parted calyx, petals united, stamens ten, and five carpels. The species are succulent plants with showy flowers, from Mexico. Many are cultivated in other countries in greenhouses.

ECHIALES, n. *ĕk-ĭ-ā′lēz* [mod. L. *echium*]: in *bot.*, alliance of perigynous exogens. It has dichlamydeous, monapetalous, symmetrical or unsymmetrical flowers, nucamentaceous fruit, consisting of one-seeded nuts, or of clusters of them separate or separable, and a large embryo

with little or no albumen. It contains the orders *Jasminaceæ*, *Salvadoraceæ*, *Ehretiaceæ*, *Nolanaceæ*, *Boraginaceæ*, *Brunoniaceæ*, *Lamiaceæ*, *Verbenaceæ*, *Myoporaceæ*, and *Selaginaceæ*. ECHIAL, a. *ĕk′ĭ-al*, pertaining, relating, or akin to the alliance *Echiales*, or to the genus *Echium*. ECH′IALS, n. the echial alliance.

ECHIDNA, n. plu. *ĕ-kĭd′nă* [Gr. *echidna*, a viper]: genus of quadrupeds peculiar to Australasia, and belonging to the order *Monotremata*. Four species of these egg-laying mammals have been described, of which two are found in New Guinea. One egg is laid at a birth, and is then put in the mammary pouch to be hatched. It was formerly said that the specific distinctions (such as the greater abundance of hair) were not real, but depended merely on age. The Echidna is about the size of a hedgehog, and, like that animal, is covered with spines; which, however, are much larger and stronger, and are placed among soft silky chestnut-colored hair. Its head is small, the muzzle much elongated and slender, terminating in a small mouth, which is destitute of teeth but furnished with several rows of small spines upon the palate, directed backwards. The tongue is extensile, and is used, like that of ant-eaters, for catching ants, the ordinary food of the animal. The tail is very short. The legs are also very short, each foot furnished with five large broad claws, fit for digging and burrowing, the claws of the hind feet being concave, and directed backward and outward, forming very efficient shovels for throwing out the earth. The echidna burrows with great rapidity, being possessed of strength perhaps greater in proportion to its size than that of any other quadruped. When it cannot more completely disappear under the earth, it inters itself so far as to present only its spiny back to an assailant. The echidna is capable of very long abstinence, and confines itself to its burrow during droughts. In confinement, it may be fed on milk, hard-boiled eggs, etc.

ECHIMYD, *ē-kī′mĭd* (*Echimys*): genus of rodent quadrupeds, in some of their characters agreeing with dormice, but differing from them in having the tail scaly, and the fur coarse and mingled with flattened spines. They all are S. American. Some of them are known as spiny rats. They display considerable beauty of color. One species excavates long burrows in the ground.

ECHINATE, a. *ĕk′ĭ-nāt*, or ECH′INATED, a. [L. *ĕchīnus;* Gr. *ĕchīnos*, a hedgehog: It. *echino;* F. *échine*, a spine]: set with prickles; prickly; bristled. ECHINOIDEA, n. *ĕk′ī-noy′dĕ-ă* [Gr. *eidos*, likeness]: a class of the *Echinodermata*, comprehending the marine creatures known as sea-eggs or sea-urchins (see ECHINID.E). ECH′INITE, n. *-nīt*, a general term for any fossil sea-urchin, or part of one. ECHINOBRIS′SUS, genus of echinoids, the typical one of the family *Echinobrissidæ*. ECHINUS, n. *ĕ-kī′nŭs*, a sea-hedgehog; a sea-urchin; a prickly head or top of a plant; an ornamental molding with oval spaces. ECHINOCOCCI, n. plu.

ē-kĭn′ō-kŏk′sĭ [Gr. *kokkos*, a berry]: the larval forms of the tapeworm of the dog: sing. *Echinococcus* (see TAPE-WORM). ECHINODERM, n. *ĕ-kĭn′ō-dėrm*, ECHIN′ODER′MATA, n. plu. *-dėr′mă-tă*, or ECHIN′ODERMS, n. plu. *-dėrmz* [Gr. *derma*, skin]: a sub-kingdom of invertebrates, like the star-fish and sea-urchin, all less or more covered with a firm crustaceous substance, often densely armed with spines. ECHIN′ODER′MAL, a. *-măl*, relating to the echinodermata. ECHINOLAMPAS, n. *ĕ-kī-nō-lăm′pas* [Gr. *lampas*, a torch]: genus of echinoids, the typical one of the family *Echinolampadæ;* in *paleon.*, range from Tertiary period till now. ECHINONIDÆ, n. *ĕ-kī-nŏn′ĭ-dē* [mod. L. *echinoneus*]: a family of irregular echinoids, the only fossil genus of which, *Pyrina*, is of Cretaceous age. ECHINOPÆDIUM, n. *ĕ-kĭn′ō-pē′dĭ-ŭm* [Gr. *paidĭŏn*, a child]: the embryo or larva of the echinodermata. ECHINORHYNCHUS, n. *ĕ-kī-no-rĭng′kŭs* [Gr. *rhunghos*, a snout, a muzzle]: genus of entozoa which contains the most noxious of the intestinal parasites, but happily none of them infest man. The largest species (*E. gigas*) is found in the intestines of the hog. Many others, not a few microscopic, are found in the intestinal canal of fishes. ECHINOTHURIA, n. *ĕ-kī-no-thūr′ĭ-a* [Gr. *thura*, a door]: genus of echinoids, typical of the family *Echinothuridæ*, with regular tests, but with the plates so overlapping each other as to render the whole structure flexible; in *paleon.*, its range is from Cretaceous times till now. ECHINOZOA, n. *ĕ-kī-no-zō′a* [Gr. *zoon*, a living creature]: name given by Prof. Allman to the sub-kingdom of animals, called by Prof. Huxley Annuloida. ECHINULATE, a. *ĕ-kĭn′ū-lāt*, possessing spines.

ECHINE′IS: see REMORA.

ECHINIDÆ, *ĕ-kīn′ĭ-dē*, or ECHINOIDEA: class of *Echinodermata*, the species of which are popularly known as sea-urchins, sea-eggs, etc. They have the body covered with a calcareous crust or shell, of extremely porous structure (thus differing very widely from the shells of mollusks), in polygonal plates nicely adapted to each other, and increasing by additions to the edges of each plate, so that the shell may enlarge with the enlargement of the animal, while new plates also are added around the superior orifice. The shell is pierced with rows of holes for the ambulacra (q.v.), and is externally covered in a living state with a membrane—sometimes very delicate, sometimes thick and spongy—which communicates by many delicate processes with the interior, and unites the bases of all the spines. The spines differ very much in the different genera and species, in their length, strength, number, and arrangement; they are attached to tubercles on the surface of the shell, by cup-like bases capable of working upon the tubercles, in the manner of a ball and socket joint; and they are moved by means of the connecting membrane so as to be employed in locomotion. In some species, they seem to be the principal organs of locomotion; in others, the ambulacra are so. By means of the spines, some, in which they are few and strong, can walk

even on dry ground; others, in which they are minute and very numerous, employ them in burying themselves in the sand. The mouth of the Echinocactus is situated at the lower orifice of the shell, and is generally furnished with five flat calcareous teeth, moved by a very complex apparatus of bony sockets and muscles—'a very powerful mill' for grinding down their food, which is supposed to consist of small crustaceans and mollusks. The intestine is long and spiral; the vent, in the Echinocactus of most regular form, is at the upper end of the shell, exactly opposite the mouth; in others in which there is a departure from the characteristic orbicular form, it is more or less lateral. The Echinocactus abound in all seas, and seem to have abounded still more in former geological periods. 'Of all the *Radiata*, they are most perfectly preserved in a fossil state,' and the knowledge of their habits and organization is necessary to the geologist, 'in order to understand the relations and associations of the numerous species which abound in many of the earth's strata.'—Forbes.

ECHINOCACTUS, n. *ĕ-kī-no-kăk'tŭs* [L. *ĕchīnus;* Gr. *echinos,* a hedgehog: L. *cactus;* Gr. *kaktos,* a prickly plant, apparently the Spanish Artichoke or Cardoon, *Cynara Cardunculus.* This is not the modern Cactus genus]: in *bot., genus* of *Cactaceæ,* the typical one of the family *Echinocactidæ.*

ECHINOCEREUS, n. *ĕ-kī-no-sēr'e-ŭs* [Gr. *ĕchīnos,* a hedgehog; mod. L. *cereus*]: in *bot.,* a genus of *Cactaceæ,* akin to Cereus, but with short instead of very long flowers. About 30 species are known; they are from Texas and Mexico.

ECHINODERMATA, *ĕ-kĭn'ō-dĕr'ma-tä:* one of the great groups or sub-kingdoms of animals (see ZOOLOGY), formerly included in the Radiata (q.v.). They have a digestive and a vascular system; for the former, however, there is in many of them only a single orifice; a circular and radiating nervous system has been observed in many; they are especially characterized by their well-organized skin, which in many is strengthened by calcareous plates, and in some also has the additional protection of numerous long spines. *Echinidæ* (sea-urchins) exhibit these characteristics in greatest perfection. *Asteriadæ* (star-fishes), *Ophiuridæ* (brittle stars), *Crinoideæ, Holothuriadæ* (sea-slugs, sea-cucumbers, etc.), with many orders, also are ranked among the Echinodermata, and have been variously arranged in orders by different naturalists. Spines are lacking in most of them; in some (*Holothuridæ*) the body wall contains, not exhibits, calcareous plates, and there is considerable departure from the ordinary and perfect radiate form, an approach being made to the forms of mollusks and worms, while yet the accordance with the other Echinodermata is perfect in other parts of the organization. Almost all the Echinodermata are free, moving about at the bottom of the sea; some of them—at

least in an immature state—are stalked and fixed. They are provided with 'an apparatus for water circulation,' a peculiar characteristic of radiate animals, and which 'can scarcely be said to exist in any of the other types.' By means of this it is that they fill and fit for use the suckers or *Ambulacra* (q.v.), with which most of them are provided for locomotion, respiration, and sensation. The spines as well as the ambulacra of the Echinodermata are used by those which possess them (*Echinidæ* and *Ophiuridæ*) as organs of locomotion. The British Echinodermata are described by Dr. Edward Forbes in *A History of British Star-fishes;* our Atlantic coast species in monographs by Alexander Agassiz, Cambridge, Mass.

ECHINOPHORA, n. *ĕ-kĭ-nŏf′ĕr-a* [Gr. *ĕchīnos*, a hedgehog; *phoros*, bearing, carrying]: prickly samphire, genus of *Umbelliferæ*, family *Smyrnidæ*.

ECHINOPS, n. *ĕ-kī′nŏps* [Gr. *ĕchīnos*, a sea-urchin; *ops*, the eye, the face, the countenance]: in *bot.*, genus of composite plants, typical of the sub-order *Cynareæ*.

ECHINOSPERMUM, n. *ĕ-kī-no-spĕr′mŭm* [Gr. *ĕchīnos*, a hedgehog; *sperma*, seed]: in *bot.*, genus of *Boraginaceæ*, tribe *Cynoglosseæ*.

ECHINUS, *ē-kī′nŭs*, of Vitruvius: classical molding in the form of a series of eggs, whence it is called also the ovolo or egg-molding. The eggs are sometimes divided by an anchor or dart. The type of this ornament is sometimes said to have been the chestnut and shell.

ECH′IUM: see Viper's Bugloss.

ECHO, n. *ĕk′ō* [L. or Gr. *ēchō*, a sound: in *anc. myth.*, a nymph who pined away into a sound for love of Narcissus]: sound, as of a voice, reverberated or returned to the ear from an opposite hill, wall, etc.; a repeated sound: V. to send back a sound; to be sounded back. Ech′oing, imp. Adj. sending back sound. Echoed, pp. *ĕk′ōd*, returned, as an echo. Echometry, n. *ĕ-kŏm′ĕ-trĭ* [Gr. *metron*, a measure]: the art of measuring the length of sounds. Echom′eter, n. *-tĕr*, an instrument for measuring the duration of sounds, and their intervals.—Sound is produced by waves or pulses of the air; when such a wave comes against a wall or other opposing surface, it is reflected like light, and proceeds in another direction, and the sound so heard is an echo. Even the surface of a cloud suffices to reflect sound, as may be observed during thunder and the discharge of cannon. That the echo of a sound may return to the point where the sound originated, the reflecting surface must be at right angles to a line drawn to it from that point. Oblique walls send the echoes of a person's voice off in another direction, so that they may be heard by others, though not by him. In order to echo words distinctly, the reflecting surface must on the whole be even, or so curved as to resemble a concave mirror. This last form is necessary for returning a distinct sound when the distance is considerable. A great

degree of evenness, however, is not essential, as it is no uncommon thing for the edge of a wood to return an echo. The distance of the reflecting surface must also be such as to allow a sufficient time to elapse between the sound and the return of the echo for the ear to distinguish them; when they succeed too closely, they merge into one. An interval of about $\frac{1}{9}$ of a second is necessary to discriminate two successive sounds; so that if we assume 1,125 ft. as the distance traversed by sound in a second, $\frac{1}{18}$ of 1,125, or 62 ft., will be the least distance at which an echo can be heard, as the sound will go that distance and return in $\frac{1}{9}$ of a second. If the distance is less, the echo only clouds the original sound, but is not heard as distinct. It is these indistinct echoes that interfere with hearing in churches and other large buildings (see ACOUSTICS); hence anything that breaks the evenness and continuity of the reflecting surfaces is an improvement in this respect. The number of syllables that any particular echo will repeat, depends upon how many can be uttered in the time that the sound takes to go and return from the reflecting surface. The echo at the tomb of Metella, in the Campagna, near Rome, of which Gassendi speaks as repeating a hexameter line requiring $2\frac{1}{2}$ seconds to utter it, must therefore come from a distance of about 1,500 ft. Such echoes are rare, as the various conditions are seldom all fulfilled. When there happen to be several reflecting surfaces at different distances in the direction of the sound, with a sufficient interval between them, each gives a separate and distinct echo. A similar effect is produced when two surfaces are inclined to each other in such a way as to give repeated reflections of the sound from the one to the other like the mirrors of a kaleidoscope, thus multiplying echoes of echoes. To this multiple and repeating class belong the famous echoes of Killarney, and that produced between the wings of the castle of Simonetta, near Milan, which repeats the report of a pistol 60 times.—ECHO, in Music, repetition of a melodic phase, frequently written for the organ, on account of the facility with which it can be produced by the stops.

ECHO, n.: in *myth.*, nymph, daughter of Aer and Tellus. She was one of Juno's attendants, but, according to one legend, her loquacity having displeased Jupiter, of whose amours she had become cognizant, she was deprived of the power of speech by Juno, and only permitted to answer questions. She fell in love with Narcissus, and her love being slighted, she pined away, and was changed into a stone, which still retained the power of voice: in *astron.*, an asteroid, the 62d found; discovered by Ferguson, 1860, Sep. 15.

ECHO CAÑON, *ĕk'ō kăn'yon* or *kân'yōn:* one of the remarkable ravines of Utah Terr., in Summit co.; on the Union Pacific railroad, near Echo City and the Weber river; about 40 m. s.e. of Ogden, 40 m. n.e. of Salt Lake City, 975 m. w. of Omaha. It is inclosed by high and almost perpendicular walls of rock, and is the centre of a panorama of exceptional grandeur.

ECIJA, *ā'thē-châ:* city of Spain, Andalusia, province of Seville, 45 m. e.n.e. of the town of Seville, on the left bank of the Jenil, lat. 37° 33′ n., long. 5° 8′ w. It is surrounded by gardens, and stands in the centre of a district fertile in corn and oil. It is well-built and prosperous. On account of the heat of the climate, this town is called by the Spaniards the Oven of Andalusia. Ecija has many pleasant alamedas (public promenades), shaded by trees, and adorned with statues and fountains; the principal promenade is along the banks of the river. Ecija was called in ancient times *Astigis*, and was one of the chief cities of the Roman province of Hispania Bœtica; its origin is unknown. It is said to have been visited by the Apostle Paul, a gilt statue of whom is in the city. Ecija was called *Colonia Augusta Firma* by the Romans, and abounds in Roman antiquities. It also presents several specimens of Moorish architecture in the shape of gates and massive towers.—Pop. (1900) 24,392.

ECK, *ĕk*, Johann Mayr von: adversary of Luther: 1486–1543; b. at Eck, a village in Swabia, where his father, Michael Mayr, was a peasant, and afterward a bailiff. Endowed with considerable ability, young Eck commenced at an early period the study of the Church Fathers and the Scholastics and acquired great skill in theological disputation. In 1518, when his *Obelisci* appeared in opposition to Luther's *Theses*, he was doctor of theology, canon of Eichstädt, and pro-chancellor of the Univ. of Ingolstadt. The publication of his *Obelisci* involved him in a disputation with Karlstadt, which lasted 1519, June 27–July 16. The only effect of the disputation on the people was to make them wonder at Eck's volubility; but having impugned some of Luther's views in the course of his disputation, he was assailed by the great Reformer, and by Melancthon. Eck nicknamed his opponents *Lutherans*, and instigated, partly by personal hatred, and partly by Fugger (q.v.), went to Rome 1520, to induce the pope to take strong measures against Luther. He returned with a papal bull of condemnation in his pocket, but the people in many places stood by Luther; and at Leipsic, in particular, Eck was so roughly received, that he had to take refuge in the monastery of St. Paul's. Later he was at the Augsburg Diet of 1530, where he let slip out the memorable statement, that 'with the Church Fathers, he would venture to oppose the Augsburg Confession, but not with the Scriptures.' In the religious convocations held at Worms 1540, and at Ratisbon 1541, he took part. A desire to shine and to play an important part in the affairs of men, coupled with a strong love of lucre, were the leading features of his character. Though an extremely learned ecclesiastic, he had no great talent, but was loud, boisterous, and full of assurance.

ECKLES, James Herron, American financier: b. Princeton, Ill., 1858, Nov. 22; d. Chicago, 1907, April 14. He was graduated at the Albany, N. Y., Law School, 1880, and practised law at Ottawa, Ill., 1881–93. From 1893

till 1897 he was United States comptroller of currency. He was a Gold Standard Democrat, and president of the Commercial National Bank of Chicago.

ECKERMANN, *ĕk'ĕr-mân*, JOHANN PETER: 1792–1854, Dec. 3; b. Winsen on the Luhe, Hanover; known to the literary world through his intercourse with Goethe. He studied, 1821–23, at Göttingen, and afterward went to Weimar, where he took part in the editing of the last vol. of Goethe's *Sämmtliche Werke*. At the same time, he commenced to contribute articles to the *Morgenblatt*, on Art and Antiquity. In 1827, the Univ. of Jena conferred on him the degree PH. D. Two years later, he was appointed to superintend the studies of the heir to the grand duchy of Weimar, in the German and English languages and literature. In 1830, he travelled with Goethe's son in Italy, and on the death of the patriarch of German literature, he edited his posthumous writings. During 1839–40, he edited a new edition of Goethe's *Sämmtliche Werke*, 40 vols. But Eckermann is known most widely and favorably by his *Gespräche mit Goethe* (Conversations with Goethe). The greater part of these *Gespräche* appeared at Leipsic 1836, the remainder at Magdeburg 1848. It cannot be said with truth that Eckermann has done for Goethe what Boswell did for Johnson, because Goethe did not require this. Johnson's writings give us but a faint idea of the man; hence Boswell's *Life* is like a revelation; whereas there was the most perfect harmony in Goethe between the man and the author. Still, Eckermann's book is of great value, because it shows this harmony, giving, as it does, a picture of Goethe in his manifold social and literary relations, and manifesting the simple, natural, and noble principles on which he studied and wrote. The *Gespräche* have been translated into all European languages, even into Turkish. The best Englislc translation is by John Oxenford (Lond. 1850). Eckermann died at Weimar.

ECKERT, *ĕk'rĕt*, THOMAS THOMPSON: b. St. Clairsville, O., 1825, Apr. 23: telegrapher. He constructed the telegraph line between Pittsburg and Chicago, and became its supt. 1852; organized and managed the entire system of the military telegraph during the civil war; was asst. sec. of war 1864–66; brevetted brig. gen. 1865; was appointed gen. supt. e. division of the Western Union Telegraph Company 1865; organized the Atlantic and Pacific Company 1874, and the American Union and the American Telegraph and Cable Companies 1880; and became vice-pres. and gen. manager of the Western Union 1881, and president, 1893.

ECKFORD, *ĕk'ford*, HENRY: 1775, Mar. 12—1832, Nov. 12; b. Irvine, Scotland: naval architect. He became a ship builder in New York 1796, designed and constructed a fleet of war vessels for the U. S. govt. 1812–14, built the *Robert Fulton* which made the first voyage by steam to New Orleans and Havana, became naval constructor at the Brooklyn navy yard 1820, resigned, and built several war vessels for European and S. American govts., and, entering

the service of Turkey, built the navy yard at Constantinople 1831.

ECKHART, *ĕk'hârt*, JOHANNES: 1260–1329; b. Strasburg: father of German mysticism. He studied theology and philosophy in Paris, entered the Dominican order in Rome, and became prior in Erfurt, vicar gen. in Bohemia, prior in Frankfort-on-the-Main, and provincial in Cologne. He introduced many reforms into the monasteries of his order, and in his sermons gave expression to such extreme mysticism that he was accused of heresy by Abp. Henry while at Cologne 1327, taken before a tribunal of the Inquisition, and had 28 sentences in his sermons condemned by a papal bull 1329, which also declared that he had recanted before his death. Against this alleged recantation, some of his followers produced a document, dated 1327, Feb. 13, which contained his vigorous protest against a malicious interpretation of some isolated passages in his sermons, and his declaration that his doctrines had never gone beyond the bounds of orthodoxy. He was regarded by his contemporaries as one of the profoundest thinkers of all ages, and one of the greatest of German writers. The starting point of his doctrine is that, apart from God, there is no real being. But, in his view, God is the unknown. He conceives of the Godhead, as without any thing that can be affirmed concerning it. Any thing definitely ascribed to it would limit and therefore destroy its infinity. The Godhead is not God as known to us. From it proceeds the triune God, who is known. The *essence* or Being of the Godhead is what it is in itself; its *nature* is that which it becomes as an object for others. It reveals itself in the personal God, the Father. The Son is the word or expression through and in which the Father becomes self-conscious. The Father eternally begets the Son, and the Son's return into the Father in love and mutual will is the Spirit. The Father is not before the Son; only through the begetting of the Son, only through arriving at self-consciousness, does he become the Father. The genesis of the Son from the Father involves also the production of the world of things; for God is reason, and in reason is contained the ideal world of creatures. In the Son all things are made in ideal form. As all things have arisen from God, so they all tend to return to him. Repose in him is the end of all things; and in man, the noblest of creatures, this end is realized. In him specially, there is the power of reaching to the absolute, the ground both of God and the universe. This power—which Eckhart called *the spark*—is in truth God working in man. In man's act of cognition of God, God and man are one; there is no distinction of knower and known. Union with God —the birth of the Son in the soul—is the ultimate end of activity, and is to be attained by resigning all individuality. When this is reached the soul is one with God; its will is God's: it cannot sin. Yet all this applies only to the 'spark' in the soul, the other powers of which may be properly employed about other things. Thus, the way is

left open to adjust the balance between feeling and action; between philosophical theory and practical life. In Eckhart's theories appear at least the elements of some modern metaphysical speculations. A collection of all his writings that have been preserved has been published in the 2d vol. of Pfeiffer's *Die Deutchen Mystiker* (Leipsic 1857).

ECKHUNG CHOO, *ek-kŭng′ chô:* river of Tibet, supposed the head stream of the Indus. It rises on the n. side of the Himalaya, near the sources of the Sutlej. The actual locality of its sources has been assigned to the Kailas Mountains, lat. 31° 25′ n., and long. 81° 40′ e. Flowing to the n.w., Eckhung Choo reaches long. 79° e. before it assumes the name of Indus.

ECKMÜHL, *ĕk′mûl:* village on the Laber, Bavaria, notable for the battle 1809, Apr. 22, between 75,000 French and 40,000 Austrians. The Archduke Charles had taken up his position on the right bank of the Danube, near Eckmühl. From this point, at the head of four divisions of Austrian army, he threatened Napoleon, and hoped to gain possession of the road to Dönauworth, the occupation of which would have decided the fate of Bavaria. This was prevented by Davout, who, moreover, by repeated attacks, contrived to keep the archduke in ignorance of Napoleon's designs. The plan of the latter was to cut off the Austrians from their whole remaining communications with the Iser and Inn, and by throwing them back upon Ratisbon and Bohemia, as their only line of retreat to sever them entirely from the support and protection of Vienna. Apr. 22, Napoleon suddenly appeared, with his army, opposite the village of Eckmühl. The action, on the side of the French, was commenced by Lannes, who drove back the Austrian left, while the village of Eckmühl was stormed by the Würtembergers. Soon, the high grounds between Eckmühl and Laichling, also occupied by the Austrians, were abandoned after a heroic struggle, and the archduke ordered a retreat on Ratisbon, which was admirably executed, though the defeated army was harassed by 16 cavalry regiments. During the retreat, a magnificent and thrilling encounter took place at Eglofsheim between the French and Austrian cuirassiers, which, though it ended fatally for the latter, was largely instrumental in securing the retreat of the main body of the Austrian army. The Austrians had 5,000 men killed and wounded, and 7,000 taken prisoners, beside losing 12 standards and 16 pieces of cannon. The French loss was considerably less.

ECKSTEIN, *ĕk′stīn*, Ernst, German humorist, poet, and novelist: b. Giessen, 1845, Feb. 6; d. 1900. From the university he went to Paris, and there completed his comic epos *Check to the Queen* (1870), and wrote *Paris Silhouettes* (1873), *Varzin Ghosts*, and the *Mute of Seville*. Later he wrote *Margherita; At the Tomb of Cestius; The Mosque at Cordova*. He was editor of a literary and critical journal, *Hall of Poets*, and of a humerous weekly, *The Wag*, at Leipsic for some years. He also wrote *The*

Claudii; Aphrodite, a Story of Ancient Hellos; Decius the Flute-player, a Merry Story of a Musician in Ancient Rome.

ÉCLAIRCISSEMENT, n. *ā-klār'sĭs-măng'* [F.—from F. *é*, OF. *es*, for L. *ex*, out; F. *clair*, clear—from L. *clārus*]: the clearing or explaining any thing or affair not before understood; explanation; *dénouement.*

ECLAMPSY, n. *ĕk-lămp'sĭ*, or ECLAMP'SIA, n. *-sĭ-ă* [Gr. *eklampsis*, a shining forth—from *ek*, forth, from; *lampein*, to shine]: a convulsion: a term applied especially to convulsions in infancy (infantile eclampsy) or in a parturient woman (puerperal eclampsy). See CONVULSION.

ÉCLAT, n. *ā'klâ* [*éclat*, an explosion, sudden splendor—from *éclater*, to fly into fragments]: sudden splendor or brightness, applause; show; pomp; striking effect.

ECLECTIC, n. *ĕk-lĕk'tĭk* [Gr. *eklek'tĭkŏs*, selecting—from *ek*, out of *lego*, I choose or gather: F. *éclectique*]: choosing or selecting, as opinions or doctrines: N. any philosopher in anc. times who selected his opinions and principles from various sources. ECLEC'TICALLY, ad. *-lĭ.* ECLEC'TICS, n. plu. *-tĭks*, a sect of philosophers; a certain sect of Christians; in *Amer.*, a school of medical practitioners.

ECLECTICS, *ēk-lĕk'tĭks*—ECLECTICISM, *ĕk-lĕk'tĭ-sĭzm:* a school of philosophers, and their philosophic system. Eclectics was the name given in ancient times to those philosophers who had no determinate system of their own, but who professed to choose (*eklegein*) from all systems the parts that they considered true. In this sense Cicero and Seneca were eclectics. The name is often given specifically to the Alexandrene school founded by Ammonius Saccus, about 200 A.D., and afterwards called *Neo-Platonists* (q.v.). The systems from which selections were originally made by this school were those of Pythagoras, Plato, and Aristotle, but ultimately their electicism lapsed into an attempt to reconcile Platonism and Christianity; and the later application of the term eclectic was to one who was engaged in this attempt. The chief representatives of this school were Plotinus and Proclus, who, however, did not so much make up a compound of doctrines gathered from without, as set up a view that endeavored to unite the results of previous systems into a consistent whole. Many of the early Fathers of the Christian Church who had been educated in the pagan schools of philosophy and rhetoric, and retained a fondness for their early studies, were eclectics, such as Clemens Alexandrinus, and Synesius of Cyrene. In modern times eclectic is used to characterise the work of any philosopher who does not so much try to work out a system of his own, as to put together into one scheme what seem to him to be the best features of all systems. Leibniz and Victor Cousin are thus called eclectics. Since this method is liable to result in a crude mosaic instead of a well organized system, the term is often used in reproach.

ECLECTIC SCHOOL OF MEDICINE, American: system of med. theory and practice. It makes profession of adopting whatever in materia medica or in therapeutics is proved to be of value, and of modifying its practice in accordance with every new discovery in the medical art. It holds the doctrine of 'specific medication,' the specifics being directed not against symptoms, but against specific pathological conditions: the morbid products of such conditions are held to be excreted by the action of the specifics. The first eclectic med. college in the United States, the New York Reformed Med. College, was founded by Dr. Wooster Beach, 1826; the next was founded at Worthington, O., 1826; this also was called a reformed med. college, but when the Worthington school was transferred to Cincinnati, 1843, it assumed the style Eclectic Med. Institute. Hence the Cincinnati institute is regarded as the parent school of eclectic medicine; it still exists in a flourishing condition. To Dr. John M. Scudder of the eclectic med. institute of Cincinnati is due the doctrine of specific medication accepted by the eclectic school. By the middle of the 19th c. colleges of eclectic medicine had been established in many cities in the east and in the west; state med. societies also of the eclectic school were formed at an early date; the National Eclectic Med. Assoc. was incorporated by the legislature of N. Y. 1870.

ECLIPSE, n. *ē-klĭps'* or *ĕ-klĭps'* [F. *éclipse*—from L. *eclipsis;* Gr. *eklcipsis,* a forsaking, a being absent, an eclipse—from Gr. *ek,* out; *leipo,* I leave: It. *eclisse*]: the phenomenon of a celestial body disappearing from view, in whole or in part, in consequence of another celestial body, or its shadow, passing between it and the spectator; darkness. V. to hide or conceal a luminous body in whole or in part; to cloud or darken; to disgrace. Eclip'sing, imp. Eclipsed', pp. *klĭpst',* concealed; darkened; outshone. Eclipsa'reon, a contrivance invented by the astronomer Ferguson for exhibiting the time, quantity, duration, and progress of solar eclipses. Eclip'tic, n. *-tĭk,* the apparent path of the sun in the heavens in a year—so called because an eclipse cannot take place unless the moon be in or near the ecliptic.

ECLIPSE: obscuration of one of the heavenly bodies by the interposition of another, either between it and the spectator, or between it and the sun. The causes of eclipses, as suggested in this definition, are so simple and familiar, that it is difficult for us to imagine how deeply eclipses affected men's minds before the dawn of astronomical science. To the ancients, they were events outside the order of nature—terrible presages of dire events; and at Rome, at one time it was blasphemy, and punished by law, to talk publicly of their being due to natural causes. So strong a hold had this superstition on the popular mind, that even after it came to

be generally believed that eclipses of the sun were caused by the moon coming between us and that orb, eclipses of the moon were still referred to supernatural agency. When the moon was in E., the people turned out and made a great noise with brazen instruments—the idea being, that by doing so they gave her ease in her affliction. According to some, Luna, when in E., was in the pains of labor; according to others, she was suffering from the arts of wicked magicians. Similar notions have prevailed among all barbarian tribes. The Chinese, it is well known, imagine eclipses to be caused by great dragons trying to devour the sun and moon, and accordingly they beat drums and brass kettles to terrify the monsters into letting go their prey. Several stories are told of these popular superstitions being turned into good account by knowing persons; among which are those which represent Thales as bringing about peace between the Medes and Lydians; and Columbus, when in a great strait, procuring provisions from the natives of Jamaica, through the prediction of eclipses.

Stars, planets, and the satellites of planets, may suffer eclipse. The principal eclipses, however, are those of the sun and moon, called, respectively, 'solar' and 'lunar' eclipses. The transits of the lower planets over the face of the sun are partial solar eclipses; but solar eclipses, properly so called, are those caused by the interposition of the moon between the sun and earth. Regarding solar eclipses, it is observed that they happen always at the time of new moon, when the sun and moon are in conjunction, i. e., on the same side of the earth. In a partial eclipse, the sun's disk suddenly loses its circular form; it becomes indented on one side, the indentation slowly increasing for some time, and then diminishing until it disappears altogether. In a total eclipse, the indentation goes on increasing till the whole orb for a time disappears; after a short interval, the sun reappears again, passing through the same phases of obscuration in an inverse order. In an annular eclipse, the whole orb is obscured except a ring of annulus. Lunar eclipses, again, it is observed, happen always at full moon, or when the sun and moon are in opposition, or on opposite sides of the earth, and are caused by the moon passing through the earth's shadow. Such eclipses are sometimes partial, and sometimes total, but never annular, and in their general phases they resemble those of the sun.

In speaking of eclipses, certain terms are used. The *duration* of an E. is the time of its continuance, or the interval between immersion and emersion. *Immersion* or incidence of an eclipse is the moment when part of the luminary begins to be obscured; *emersion* or *expurgation* is the time when the luminary begins to reappear or emerge from the shadow. When the quan-

tity of an eclipse is mentioned, the part of the luminary obscured is intended. To determine this part, it is usual to divide the diameter of the orb into twelve *digits;* and the eclipse is said to be of so many digits, according to the number of them contained in that part of the diameter which is obscured.

1. *Eclipses of the Moon.*—It has been said that these are caused by the moon passing through the earth's shadow. Before this explanation can be accepted, it must be shown that that shadow extends as far as the moon. This is easily done. Supposing the earth to have no atmosphere, then the shadow is the cone marked in shade in fig. 1, whose apex is at O; and the question is, whether the distance OT from the apex to the earth's centre exceeds the moon's average distance from the earth. Drawing TB, SA, from the centres of the earth and sun respectively, perpendicular to the line OBA, touching both spheres, and the line TC parallel to the line OBA, we have from the similar triangles OTB, TSC, the proportion OT: TB: : TS:SC. Now, we

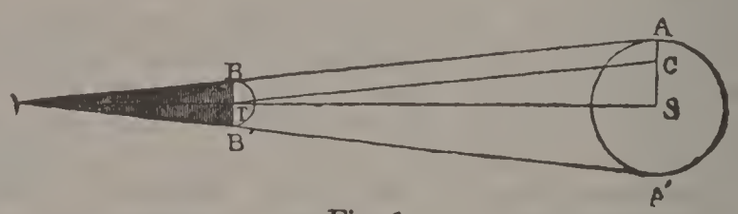


Fig. 1.

know that TS, the (mean) distance of the sun, is equal to about 24,000 times TB; also, from the construction, AC=TB; and we know that SA=112 times TB, whence it follows that SC=111 times TB. The above proportion, then, gives OT = 216 times TB, since $\frac{24000}{111}$ = 216 nearly. But the moon's average distance is only 60 times TB (the earth's radius). Hence it appears that the length of the earth's shadow is almost four times the average distance of the moon, and that the moon can enter it. Further, it is clear that, should it do so, it may be totally obscured; for it must enter at a point much nearer T than half the distance OT, which is 108 times TB; and everywhere within that distance it might be shown the breadth of the shadow is much greater than the moon's disk. But one consideration remains to complete the proof of the theory of lunar eclipses. It was mentioned that they occur only at full moon, and we know that to be the only time when the earth is between the sun and moon, and so *has a chance* of throwing her shadow upon it. Why they do not occur every full moon, will be explained in treating of the prediction of eclipses.

In the foregoing explanation, we proceeded on the assumption that the earth has no atmosphere. If the assumption were correct, the earth's shadow would be darker and narrower than it is, and the phenomena of

eclipses of shorter duration, but more striking. The effect of the atmospheric refraction (see REFRACTION) is to bend the rays which are incident on the atmosphere in toward the axis of the cone of the earth's shadow, those which pass through the lowest strata of the air being most refracted, and converging to a point in the line OT (see fig.1), at a distance equal 42 radii of the earth from the earth's centre. Accordingly, the moon, which, as we have seen, crosses the shadow at a distance of about 60 radii, never enters that part of it which is completely dark; thus she never loses her light entirely, but appears of a distinct reddish color resembling tarnished copper—an appearance caused by the atmospheric refraction, in the same way as the ruddy color of the clouds at sunset. There is another reason why the phenomena of a lunar eclipse are less striking than, from the explanation given relative to fig. 1, might be expected. Every shadow cast by the sun's rays necessarily has a penumbra, or envelope, on both sides of the half-shadow. In the case before us (fig. 2), suppose a cone having its apex O′

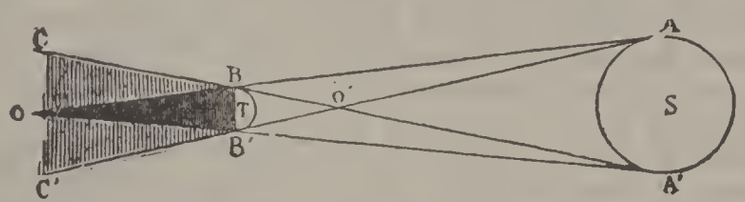


Fig. 2.

between the sun and earth, and enveloping each of them respectively in its opposite halves, AO′A′ and CO′C′ (fig. 2). It is clear that from every point in the shaded part of the cone CO′C′, and without the shadow BOB′, a portion of the sun will be visible—and a portion only—the portion increasing as the point approaches either of the lines CB, C′B′; and diminishing as it approaches the lines BO, B′O. In other words, the illumination from the sun's rays is only partial within the space referred to, and diminishes from its extreme boundary lines toward the lines BO, B′O. When, then, the moon is about to suffer eclipse, it first loses brightness on entering this penumbra; so that when it enters the real shadow, the contrast is not between one part of it in shade and the other in full brilliancy, but between a part in shade and a part in partial shade. On its emersion, the same contrast is presented between the part in the umbra and the part in the penumbra.

2. *Prediction of Lunar Eclipses.*—It was stated above that lunar eclipses happen only at full moon. They do not happen every full moon, because the moon's orbit is inclined to the ecliptic, on which the centre of the earth's shadow moves at an angle of 5° 9′ nearly. An eclipse can occur only on a full moon happening when

the moon is at or near one of her nodes, or the points where her orbit intersects the ecliptic. An eclipse clearly can happen only when the centres of the circle of the earth's shadow and of the moon's disk approach within a distance less than the sum of their apparent semi-diameters; and this sum is very small; so that except when near the nodes, the moon, on whichever side of the ecliptic she may be, may pass above or below the shadow without entering in the least. The moon's average diameter is known to be 31′ 25″ 7, and from the *Nautical Almanac* may be ascertained its exact amount for any hour—its variations all taking place between the values 29′ 22″ and 33′ 28″. As for the diameter of the circle of the shadow, it is easily found by geometric construction and calculation, and is shown to vary between 1° 15′ 32″ and 1° 31′ 36″; and its value for any time may be found from the *Nautical Almanac*, to which value astronomers usually add 1′ as a correction for its calculation proceeding on the assumption that the earth has no atmosphere. Starting from these elements, it is a simple problem in spherical trigonometry—which may be solved approximately by plane trigonometry by supposing the moon and the earth's shadow to move for a short time near the node in straight lines—to fix the limits within which the shadow and moon must concur to allow of an eclipse. Recollecting that the earth's shadow on the ecliptic is at the opposite end of the diameter from the sun, and that therefore as it nears one node the sun must approach the other—the sun and shadow being always equidistant from the opposite nodes—we find, from the solution of the above problem: 1. That if, at the time of full moon, the distance of the sun's centre from the nearest node be greater than 12° 3′, there cannot be an eclipse. 2. If at that time the distance of the sun's centre from the nearest node be less than 9° 31′, there will certainly be an eclipse. 3. If the distance of the sun's centre from a node be between these values, it is doubtful whether there will be an eclipse, and a detailed calculation must be resorted to, to ascertain whether there will be one or not.

Before the laws of the solar and lunar motions were discovered with anything like accuracy, the ancients were able to predict lunar eclipses with tolerable correctness by means of the lunar cycle (see SOLAR CYCLE) of 18 Julian years and 11 days. Their power of doing so turned on this, that in 223 lunations the moon returns *almost* exactly to the same position in the heavens. If the moon did return to *exactly* the same position, then, by simply observing the eclipses which occurred during the 223 lunations, we should know the order in which they would recur in all time coming.

All lunar eclipses are universal or visible in all parts of the earth which have the moon above their horizon, and are everywhere of the same magnitude with the same beginning and end; and this universality of lunar

eclipses is the reason why it is popularly thought, contrary to the fact, that they are of more frequent occurrence than solar eclipses. The eastern side of the moon, or left-hand side as we look toward it from the north, is that which first immerges and emerges again. The reason of this is, that the proper motion of the moon is swifter than that of the earth's shadow, so that she overtakes it with her east side foremost, passes through it, and leaves it behind to the west. It will be readily understood, from the explanations above given that eclipses of the longest duration happen in the very nodes of the ecliptic. Total eclipse may occur within a short distance of the nodes, but will then be of short duration.

3. *Eclipses of the Sun*, so called, are caused, as above stated, by the interposition of the moon between the earth and sun, through which a greater or less portion of the sun is hid from view. In one sense, a solar eclipse might be called an eclipse of the earth, caused by the moon's shadow falling upon it.

By a process similar to that used in ascertaining the length of the earth's shadow, it can be shown that the greatest value of the length of the moon's shadow is 59.73 semi-diameters of the earth; at the same time, we know that the least distance of the moon from the earth is about 55.95 semi-diameters. It follows that when a conjunction of the sun and moon happens at a time when the length of the shadow and the distance of the moon from the earth are, or are nearly, equal to the values above stated, the moon's shadow extends to the earth and beyond it. Should the shadow in these circumstances fall upon the earth, there will be a total E. of the sun at all places within it or over which it moves (fig. 3). If L be the moon, T the earth, and *ab*L the moon's shadow cast by the sun, there will be a

Fig. 3.

total E. of the sun at every point that is completely within the portion *ab* of the earth's surface. Again, the smallest value of the length of the moon's shadow may be shown to be 57.76 semi-diameters of the earth, and the greatest distance of the moon from the earth is 63.82 semi-diameters. Suppose the moon interposed between the earth and sun when these values concur, it is clear that the moon's shadow will fall short of the earth. In this case the sun cannot be altogether hid from any point of the earth's surface; but this case, or one approximate to it, is that in which there will occur an annular eclipse. In fig. 4, suppose O to be

the apex of the shadow which falls short of the earth, and conceive the cone of the shadow produced earthward beyond O into a second cone *Ocd;* then from every point within the section *cd* of the earth's surface, the moon will be seen projected as a black disk on the middle of the disk of the sun, the portion unobscured forming a ring or annulus of light. While in the two cases just described the E. is total or annular at places within *ab* or *ed*, it will be partial at other places; the moon will appear projected against a portion of the sun's disk, making a circular indentation. To ascertain the places at which the E. will be partial, we have merely to form the cone of the penumbra of the moon's shadow in the manner explained in treating of lunar eclipses; at all places on the earth's surface within that cone there will be a partial eclipse. A simple calculation shows what is the observed fact, that the cone of the penumbra is not nearly large enough to embrace the whole of the face of the earth directed to the sun;

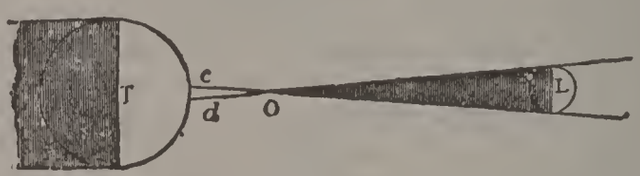


Fig. 4.

in other words, solar eclipses are not universal, like those of the moon, i. e., they are not seen from all places that have the sun above their horizon at the time of the E., which is the reason that though they are of more frequent occurrence than lunar eclipses, the latter are commonly supposed to occur more frequently.

If one could take up a position in space from which he could command a view of the whole face of the earth turned to the sun during a solar E., the phenomena which he would observe would be somewhat as follows. Marking the point of the earth first touched by the penumbra of the moon's shadow, he would observe the obscuration spreading therefrom over a wide and wider area as the penumbra advanced, till at last, supposing him to be viewing the case of a total E., there appeared the umbral cone marking the earth with a dark spot. By and by, the whole penumbral shadow would be on the earth. The black spot would then appear to travel onward with the motion of the shadow, and in its centre, in a course determined by the composition of the proper motion of the shadow or moon, and the motion of rotation of the earth. Part of the globe would be free from the affection, and, in the course of time, the umbral spot would move over different portions of the earth in succession, till at last it passed off the earth's surface, drawing after it the penumbral shadow. Could the spectator mark on the globe the various places

affected by the shadow, with their degrees of shading, he would have a perfect chart of the course of the eclipse. The small belt of the globe traversed by the umbra would mark all places at which the eclipse would be total, while the degrees of shading over places adjoining that belt on both sides would indicate the magnitude of the partial eclipse as seen from them. The breadth of the belt traversed by the umbra, when the sun's distance is greatest and the moon's least, is estimated at about 180 miles; and in the same case the penumbra is estimated to cover a circular space of 4,900 miles in diameter, the E. happening exactly at the node. If the E. does not happen at the node, it is clear that the axis of the shadow must be inclined to the plane of the ecliptic, that the shadow will be cut obliquely, and therefore that the part of the earth in shade will be oval.

Of the commoner phenomena attending an E. of the sun, as regards the appearance of that luminary, nothing need be said; they are perfectly analogous to those of lunar eclipses, except in the case of the E. being annular. There are other appearances, however, attending an E. of the sun, especially when it is total, that are very remarkable. The almost instantaneous darkening of the orb of day, particularly when it is unlooked for, is adapted to impress a spectator with vague terror; even when expected, it is impressive as a demonstration of the forces and motions of the mechanism of the universe. The sudden darkness, too, is impressive from its *strangeness* as much as from occurring by day; it resembles neither the darkness of night nor the gloom of twilight. The cone of the moon's shadow, though it completely envelopes the spectator, does not, as we have explained, inclose the whole atmosphere above his horizon. The mass of uninclosed air accordingly catches the sunlight, and reflects it into the region of the total eclipse, making there a peculiar twilight. Stars and planets appear, and animals are dismayed by the dismal aspect of nature.—See Mahoud Bey's Report of the Total Eclipse of 1860, July. Mr. Warren De la Rue, one of an expedition of scientific men who went to Spain to witness the same E., gives the following account of the aspects of nature near the time of totality: 'When the sun was reduced to a small crescent, the shadows of all objects were depicted with great sharpness and blackness, reminding one of the effects of illumination with the electric light. The sky at this period assumed an indigo tint, and the landscape was tinged with a bronze hue.'—*Athenæum*, 1860, II. 259. At totality, there was still light enough to enable the observer to draw without the aid of his lamp, while the sky near the sun presented a deep indigo, and thence passed through a sepia tint to red and brilliant orange near the horizon. It must be said, however, that the strange

appearance here recorded is exceptional, and probably not such as could ever occur in our latitude.

There is one set of phenomena invariably attending total eclipses of the sun, which are at once strange and impressive, and the causes of which are not yet fully understood. As long as totality lasts, and for a few seconds thereafter, there appears round the moon's disk a luminous corona, as in fig. 5; while in the inferior portion of this corona, and projecting beyond the dark edge of the moon, appear very brilliant prominences,

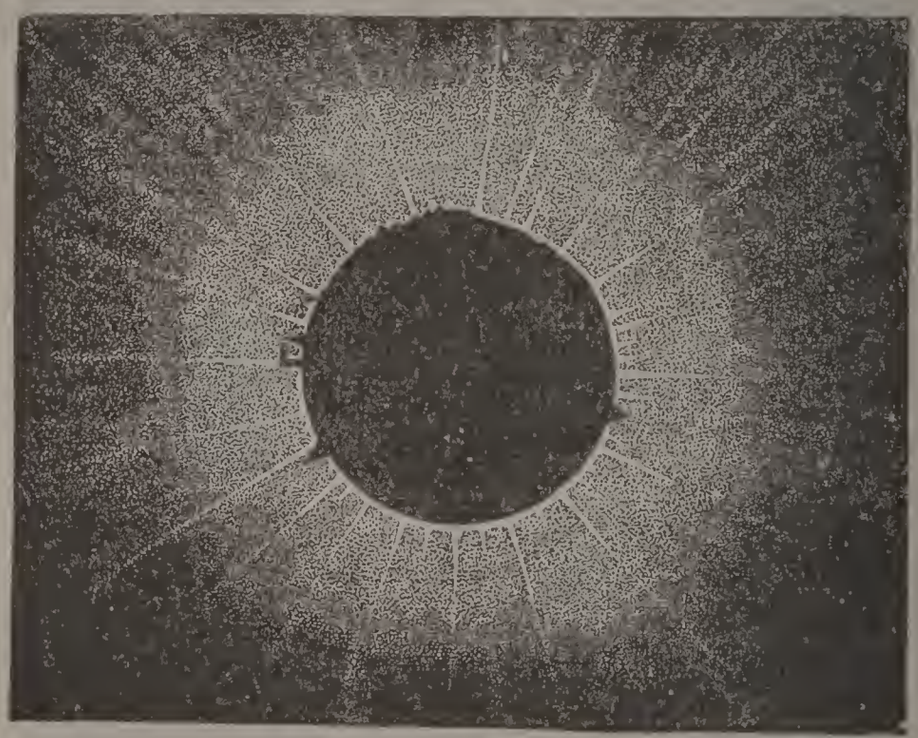


Fig. 5.—Appearance round the Sun during Total Eclipse.

generally of a red color. These prominences were first observed during the total E. of 1842, July 8. They are probably present at all times around the sun, but no method has yet been invented of rendering them visible to either the eye or the camera at any time except during a total eclipse. They can be observed, however, at almost all times, by means of the spectroscope, which reveals them to consist mainly of hydrogen gas in an incandescent state. A comparatively narrow belt of the same color and substance runs round the whole circumference of the sun. The prominences are sometimes seen to shoot up like flames, in wild, fantastic shapes, with incredible velocity, and to the height of tens of thousands of miles: see SUN.

Extending beyond the 'prominences,' are a multitude of radiations whose nature is still a mystery. Those around the poles are nearly straight; but as the equatorial regions are approached, the inferior rays become sharply curved or interwoven, forming tufts or arches whose apexes terminate in streamers reaching out to an indefinite distance from the sun. The bright, inner

1.—A 45-Foot Telescopic Camera.

Structure at left (west) end, from which walls have been partially removed and canvas roof drawn back, contains the cœlostat, equatorially mounted on a concrete base and clock-driven, which reflects the image of the eclipsed luminary through the lenses and through the long, light-tight casing, to the sensitive plates at the right (east) end.

2.—Cœlostat End of 45-Foot Telescopic Camera.

Showing the circular, plane, reflecting mirror of the cœlostat, 20 inches in diameter. The chief astronomer (with hand resting on rafter) is calling off the time intervals just preceding totality. Photos taken at Canadian Eclipse Station, Labrador, August 30, 1905, by Alfred S. Johnson, Chicago, Ill.

filaments may be due to electric discharges, while the outer and dimmer streamers are perhaps of kindred origin with the zodiacal light. The latter are not visible at every eclipse, and were first successfully photographed in India, in 1898, Jan. 22. The amount of light from the corona averages about three times that from the full moon.

Since 1878 it has been known that the form of the corona bears some relation to the eleven-year cycle of the sunspots. At sunspot minimum appear the great equatorial streamers, millions of miles in length; whereas, at the time of maximum spots, the coronal glory is more evenly developed around the sun. The relations of the two coronal type-forms, however, are not yet understood. That unmistakable changes take place very rapidly, is borne out by the evidence of photographs taken in Sumatra and Mauritius in 1901; but we have yet to learn how or when one general form of corona gives way to the other.

In all modern eclipse expeditions, greatest stress is laid on photographic work. This may relate either to the corona itself, or to its spectrum, including the spectrum of the 'flash' or innermost stratum of the corona. In fact, it is chiefly to the spectroscope and the camera that we owe what slight knowledge we possess of the physical and chemical constitution of the sun's marvelous envelope.

To provide for precise exposures of varying length and for absolutely accurate measurements, the more important instruments in the equipment of a modern expedition, are, as a general thing, immovably mounted on stable bases (usually of concrete), the image of the eclipsed luminary being reflected through the lenses or prisms, to the sensitive plates, by means of an equatorially mounted, clockwork-driven mirror known as a 'cœlostat.'

As measured by results, the most important eclipses since 1860 have been the following: 1869 (U. S.), when a bright green line in the coronal spectrum revealed the presence of an element unknown on the earth, named 'coronium;' 1870 (Spain), when Young discovered the 'reversing layer,' which, by absorption, causes the dark lines in the solar spectrum; 1878 (U. S.), when the vast equatorial streamers characteristic of the period of sunspot minimum were first observed; 1882 (Egypt), when the spectrum of the corona was first photographed; 1889 (California), when fine detail photographs of the corona were first obtained; 1893 (Africa), when the corona was first observed to rotate with the sun; 1896 (Nova Zembla), when the hypothesis of the reversing layer was confirmed; 1898 (India), when the outermost streamers were first photographed; and 1900 (U. S., Spain, Africa), when the heat of the corona was first measured with the bolometer, and many previous theories and measurements were established or corrected.

4. *Prediction of Solar Eclipses.*—The period of 18 Julian years 11 days, referred to in treating of the prediction of lunar eclipses, applies equally to solar eclipses with lunar, but the ancients, who understood that fact, could find no law of recurrence of solar eclipses within that period, so as to predict them. The reason of the failure is obvious; for though solar eclipses recur in a fixed order within the cycle, they are not visible at the same places on their recurrence as when first observed. By modern methods, however, eclipses of the sun may be predicted, with all their circumstances of time and places of observation, with the most perfect certainty. These modern methods resemble those already generally described as applied in the case of lunar eclipses. At the time of a solar E., the sun and moon are in conjunction; they are also in or near the same node; and no E. can happen if they are further than 17° from the node, or if the latitude of the moon, viewed from the earth, exceeds the sum of the apparent semi-diameters of the sun and moon. When within these limits, it is a problem of numbers and of spherical trigonometry to ascertain the nature of the E., if any, which will happen.

The number of eclipses of the sun and moon together in a year cannot be less than two nor more than seven; the most usual number is four, and it is rare to have more than six. The explanation of the limitation of the number of eclipses is connected with the fact that the sun passes by both nodes but once in a year, except in the case of his passing one early in the year, in which case, owing to the recession of the moon's nodes, he will again pass it a little before the end of the year. From the smallness of the cone of the moon's shadow, total solar eclipses are extremely infrequent in any one place, compared with the frequency of their actual occurrence. The same general region is likely to be visited only once in about 350 years. At Paris, there was only one total E. of the sun in the 18th c., that of 1724. In London, not one total E. was witnessed during the 575 years, 1140 to 1715.

Only six total eclipses of the sun will be visible in U. S. territory during the next half-century. In 1918, June 8, the moon's shadow will cross from Oregon to Florida, giving a totality of about two minutes. In 1923, Sept. 10, California and Mexico will be visited for four minutes. In 1925, Jan. 24, the Middle States and New England will be favored for two minutes, when the shadow-path will pass from near Minneapolis to Portland, Me. In 1932, Aug. 31, another two-minute eclipse, coming down from Canada, will leave the New England coast-line at about the same point. In 1934, Feb. 14, Hawaii and the Philippine Islands will witness totality for two minutes. And in 1955, June 20, in the island of Luzón, will be seen, at or near Manila, an eclipses with a totality of over seven minutes—the longest in a thousand years.

In foreign lands, the most important total solar eclipses during the next quarter-century, with regions of general visibility and approximate durations of totality, will be as follows:

	Min.
1907, Jan. 14—Russia, Persia, China	2
1911, April 28—Australasia	5
1912, Oct. 10—Colombia, Brazil	1
1914, Aug. 21—Norway, Sweden, Russia	2
1916, Feb. 3—Isthmus of Panama	2
1919, May 29—Brazil, West Africa	6
1922, Sept. 21—Australia	6
1926, Jan. 14—Central and East Africa, Sumatra	4
1927, June 29—England, Scandinavia, Siberia	1
1929, May 9—Malay Peninsula, Siam	5

ECLIPTIC: the great circle of the heavens round which the sun *seems* to travel, from w. to e., in the course of a year. It took its name from the early observed fact, that *eclipses* happen only when both bodies are in or near this path. A little attention about sunset or sunrise shows that the sun is constantly altering his position among the stars visible near him, leaving them every day a little further to the w.; and that this motion is not exactly e. and w., or parallel to the equator, also becomes evident by observing that the sun's height at mid-day is constantly altering. It is further observed that, twice a year, about Mar. 21 and Sep. 23, the sun is exactly on the equator. The two points of the equator on which the sun then stands are the equinoctial points, and are the intersections of the equator and ecliptic. Again, there are two days in the year on which the sun reaches his greatest and his least mid-day elevation: the first is June 21, the second Dec. 21. On these days, the sun has reached his greatest distance from the equator either way, and the points in his course where he thus seems to pause or halt in his retreat from the equator are called the solstices (*solis stationes*). These four points are distant from one another by a quadrant of the circle, or 90°. Each quadrant is divided in three arcs of 30°, and thus the whole ecliptic is divided into 12 arcs of that length, called signs of the zodiac (q.v.). These arcs or signs have been named after constellations through which the ecliptic passes. As the equinotical points are not fixed, but recede yearly westward about 50 seconds, and in a century about 1° 23′, the same constellations and signs that coincided when the division of the E. took place, no longer coincide. The constellation of the Ram, for instance, which originally stood in the first arc or sign, now stands in the second, every constellation having advanced forward 30°, or a whole sign. Modern astronomers therefore pay little attention to these constellations and signs, but count longitudes from the existing spring equinoctial point from 0° to 360°.

Not only do the points change where the E. and equator cross each other, but the angle of their inclination, called the obliquity of the E., also is variable. It is at present nearly 23½°, and is diminishing at the rate of about 50

seconds in a century. Were it to go on diminishing always, the E. and the equator would at last coincide, and the earth would then have an everlasting spring. The decrease, however, has a limit; the obliquity oscillates between two definite bounds, which it can never pass. It has been calculated that it was at its greatest B.C. 2000, and was then nearly 23° 53′. Since then, it has been decreasing, and will continue to do so till about A.D. 6600, when it will be at its least, and about 22° 54′. These slight alterations cannot sensibly affect the seasons.

The physical cause of this change of the obliquity is the action of the other planets, especially Jupiter, Mars, and Venus, on the mass of the earth. The fact of the change was known to astronomers in very ancient times; Herodotus mentions an old tradition of the Egyptians, that the E. had formerly been perpendicular to the equator—a notion into which they were most probably led by observing, for a long series of years, that its obliquity was constantly diminishing. There can be little doubt that the Chaldeans arrived at the epoch of 403,000 years before the entry of Alexander into Babylon, to which they proudly referred for their first astronomical observations, by computing the time when the E. was perpendicular to the equator, on the supposition of its obliquity diminishing 1′ in 100 years, Though it was not till after the discovery of the law of gravitation that the change on the obliquity could be explained, yet that it was changing was believed by many astronomers, though some doubted whether the differences in the values at different times were not due to errors of observation. The earliest known measure of the obliquity of the E. was made by Tcheou Kong, the regent of China. Among the western nations, the earliest measurements were made by Pytheas and by Eratosthenes.

ECLOGUE, n. *ĕk′lŏg* [L. *eclŏgă;* Gr. *eklŏgē*, a selection —from Gr. *ek*, out of; *lego*, I choose: F. *églogue*]: a select piece; a pastoral poem presenting shepherds and shepherdesses in some ideal scene In this department, now little entered, Spenser is the chief English example. ECLOGITE, n. *ĕk′lō jīt*, a mineral, being a fine-grained mixture of green smaragdite and red garnet.

ECLYSIS, n *ĕk′lĭ-sĭs* [Gr. *eklusis*, a release, a lowering of the voice through three quarter-tones]: in *mus.*, the flattening of sounds to adapt them to a change of key-note.

ÉCOLE POLYTECHNIQUE, *ā-kol pol-lĭ-tĕk-nĭk:* one of the most celebrated military academies in France. In 1793, all the public establishments in Paris were in a convulsed state, owing to the Revolution. In 1794, M. Lamblardie, director of the *Ponts et Chaussées* proposed the establishment of an *École Centrale des Travaux Publics*, to educate young men for military, naval, and civil engineering. Monge and Carnot favoring his plan, a school was established at the Palais Bourbon. The first list of professors comprised names which afterward acquired European celebrity—including those of Lagrange, Prony, Monge,

Hachette, Hassenfratz, Fourcroy, Vauquelin, Berthollet, Chaptal, Pelletier, Guyton, Morveau, and Merimée. In 1795, the name was changed to E. P.; many alterations were made in the organization; artillery studies were included in the course; and the pupils were ordered to wear a uniform. When Napoleon went to Egypt, 40 pupils from the E. P. accompanied him, many of whom greatly distinguished themselves. Napoleon made the organization of the school more strictly military in 1804, to identify it more fully with the army. The school was dissolved 1816, again 1830, and again 1832, on account of the impetuous way in which the pupils entered into the political disturbances of those years; but as the school suited the military genius of the French nation, it was re-established on each occasion, after the restoration of tranquillity. Candidates can be admitted only on annual competitive examinations. A proclamation from the war office, made public before Apr. 1, informs intending competitors of the subjects on which they are to be examined, and the time when the examinations begin. To be eligible as a candidate, the youth must be French, and must be more than 16, and less than 20 years of age before Jan. 1 following; but soldiers are admissible up to the age of 25, provided they can give proof of two years of service in the regular army. The cost of board alone is 1,000 francs (abt. $200) a year. A complete course of instruction lasts for two years; when the pupils who have satisfactorily passed the final examinations have the privilege of choosing, from among the various public services supplied from this school, the particular branch which they wish to enter, such as artillery, engineers, the staff, the department of telegraphs, or some of the other government monopolies. The school was reorganized by a decree of 1873, Apr. 15.

ECONOMY, n. *ĕ-kŏn′ō-mĭ* [OF. *œconomie* — from L. *œconŏmĭă;* Gr. *oikŏnŏmĭă*, the management of household affairs—from Gr. *oikos*, a house; *nŏmŏs*, a law]: the frugal and prudent management of a family or household; frugality; the judicious management and arrangement of the affairs of a nation—the study of the best system for which is called *political .economy;* a system of rules or regulations; the operation of nature in regard to animals or plants. ECONOMIC, a. *ĕk′ŏ-nŏm′ĭk*, or EC′ONOM′ICAL, a. *-ĭ-kăl*, pertaining to household matters; frugal; careful; thrifty. EC′ONOM′ICALLY, ad. *-lĭ*. EC′ONOM′ICS, n plu. *-ĭks*, the science of household affairs. ECONOMIZE, v. *ē-kŏn′ō-mīz*, to manage money matters, or household expenditure, with frugality. ECON′OMI′ZING, imp.: ADJ. using with frugality. ECON′OMIZED, pp. *-mīzd*. ECON′-OMIZA′TION, n. *-mī-zā′shŭn*, the act of using to the best purpose. ECON′OMI′ZER, n. *-mī′zĕr*, one who. ECON′OMIST, n. one who manages household matters frugally. POLITICAL ECONOMIST, one who writes on, or teaches, political economy.—SYN. of 'economical': parsimonious; saving; sparing; penurious.

ECONOMY, *ē-kŏn′o-mĭ:* Socialist village of Penn., on

the right bank of the Ohio, about 17 m. below Pittsburg. The settlement was planted 1825 by immigrants from Germany. The inhabitants own everything in common—3,500 acres of land, upward of 100 houses, a church, a school, a museum, and manufactories of wool, cotton, and silk. Pop. of community (1895) about 800.

ECON'OMY, Political: see Political Economy.

ÉCORCHÉ, n. *ā'kŏr-shā'* [F. *écorcher*, to flay, to skin—from L. *excortĭcārĕ*, to take away the bark; in mid. L. to flay—from L. *cortĭcem*, bark]: in *paint.* and *sculp.*, figure of an animal or human subject, deprived of its skin, so that the muscular system is exposed for the purposes of artistic study. From a portion of the figure the upper muscles also are removed, so as to exhibit those which lie nearer to the bone. It is not uncommon to represent the écorché in action, in the form of the Fighting Gladiator. The first person who did so was Salvage, French artist and anatomist. To render the studies of pupils more complete, Salvage had this figure engraved in all the points of view, and more or less denuded of flesh, till at last it was little more than a skeleton, the only muscles represented being those which immediately cover the bones. Figures of this kind can now be procured both in plaster and papier-maché.

ECOSSAISE, n. *ā-kŏs-āz':* in *mus.*, dance music in the Scotch style.

ECOSTATE, a. *e-kŏs'tāt* [L. *e*, or *ex*, out, without; *costa*, a rib]: in *bot.*, term applied to leaves which have no central rib or costa.

ÉCOUTES, *ā-kôt'* [Fr. *écouter*, to listen]: listening-places, in military operations connected with siege-works. They are small galleries, excavated at regular distances, and going out beneath and beyond the glacis, toward the lines and batteries of the besiegers. Their purpose is to enable the garrison to hear and estimate the works being carried on by the sappers and miners of the enemy.

ECPHASIS, n. *ĕk'fă-sĭs:* an explicit or direct explanation.

ECPHLYSIS, n. *ĕk'flĭ-sĭs* [Gr. *ekphluzō*, I bubble up]: in *path.*, vesicular eruption, confined in its action to the surface.

ECPHONEMA, n. *ĕk-fō-nē'ma* [Gr. a thing called out—from *ek*, out; *phōnē*, the voice, a sound]: in *rhet.*, a breaking out of the voice with some interjectional particle.

ECPHONESIS, n. *ĕk-fō-nē'sis* [Gr. pronunciation, exclamation]: in *rhet.*, an animated or passionate exclamation.

ECPHORA, n. *ĕk'fō-ra* [Gr. a carrying out, a projection—*ek*, out; *pherō*, I carry]: in *arch.*, the projection of any member or molding before the face of the member or molding next below it.

ECPHYMA, n. *ĕk'fĭ-ma* [Gr. an eruption of pimples—from *ek*, out; *phuō*, I grow]: a cutaneous excrescence, as a carbuncle and the like.

ECPHYSESIS, n. *ĕk-fĭ-sē′sĭs* [Gr. *ekphusaō*, I breathe out]: in *med.*, rapid breathing.

ECPYESIS, n. *ĕk-pĭ-ē′sĭs* [Gr. *ekpueō*, I bring to suppuration]: in *path.*, impetigo; a humid scale.

ÉCRASEUR, *ā-krâ-zėr′*: surgical instrument invented by M. Chassaignac, consisting of a fine chain which, passed round any malignant growth, gradually constricts it, and finally crushes its way through it by means of a screw or rack for tightening it, which is worked at the end of the handle. The advantage of this instrument over the knife is, that it causes little or no bleeding, the torn vessels spontaneously contracting and closing. It is specially applicable to cases of cancer of the tongue, piles, polypi, and various kinds of tumors. When a solid mass—as, for example, a considerable portion of the side of the tongue—is to be removed, the chain is sometimes pressed through the centre, and made to cut two lines successively in the form of a V, in which the diseased structure is included. As the pain which is caused by this instrument is very great, the patient should be placed completely under the action of chloroform before it is applied.

ECRYTHMUS, n. *ĕk-rĭth′mŭs* [Gr. *ekrhuthmos*, out of tune—from *ek*, out; *rhuthmos*, tune]: irregular or disordered beating of the pulse.

ECSTASY, n. *ēk′stă-sĭ* [OF. *ecstase*—from mid. L. *ecstasis*, a trance—from Gr. *ekstăsis*, change of state—from *ek*, out; *stăsis*, standing, state]: excessive joy; extreme delight; a state of the body in which the functions of the senses are thrown out of their usual condition; a trance. Ec′STASIED, a. *-sĭd*, enraptured; filled with extreme delight. ECSTAT′IC, a. *-stăt′ĭk*, or ECSTAT′ICAL, a. *-ĭ-kăl* [Gr. *ekstătĭkos*]: rapturous; transporting; delightful beyond measure; entrancing. ECSTAT′ICALLY, ad. *-lĭ*.—SYN. of 'ecstasy': rapture, transport, frenzy; madness; enthusiasm.

ECSTASY: state of the mind when dominated by some absorbing (usually delightful) emotion, to such extent as to alter or suspend its functions. The word is applied to those states of mind, which, without amounting to insanity (q.v.), in respect of the temporary character of the affection are marked by mental alienation, and altered or diminished consciousness. A person in ecstasy may be violently moved, or completely passive; convulsed, or rigid, or flaccid in all the limbs; silent, or uttering unmeaning or excited language, or assuming the character of a prophet or inspired person; having, or not having intelligence of what is going on around him. The varieties are infinite, because this abnormal state of the mind is nothing more in reality than the fixing of it in a particular attitude, as it were, in connection with an overmastering idea, emotion, or sensation, which causes all other external phenomena to be disregarded. Perhaps the most common, or the best known form, is religious ecstasy, allied to monomania and religious delusion of every kind. There is an ecstasy of joy, of love, of meditation; also of

hate; likewise of terror, in which fear paralyzes the consciousness and the power of motion and expression. Ecstasy is developed also in some physical states as catalepsy (q.v.), and hysteria (q.v.), inasmuch as the proper consciousness of the individual is temporarily abolished, or so much changed in character as to lead almost to the loss of the sense of personal identity. A striking picture of this form of ecstasy is the well-known sleep walking scene in *Macbeth*, where the lady's mind is so completely preoccupied with the supposed bloodstain on her hands, that though her eyes are open, we are told that 'their sense is shut,' and the mind is also excluded from all the ordinary avenues of communication.

ECTASIS, n. *ĕk'tă-sĭs* [Gr. *ektăsis*, extension—from *teinō*, I stretch]: the dilated condition of an artery, as in aneurisms, or of a vein, as in varices, usually applied to the dilatation of small blood-vessels; in *gram.*, the lengthening of a syllable.

ECTHLIPSIS, n. *ĕk-thlĭp'sĭs* [Gr. *ekthlipsis*, a pressing or squeezing out—from *ek*, from: *thlibō*, I press or squeeze]: in *Latin verse*, a rule by which a final *m* with the preceeding vowel is cut off, when the next word begins with a vowel.

ECTHYMA, n. *ĕk-thī'mă* [Gr. *ekthūma*, an eruption]: pustular disease of the skin, in which pustules often reach the size of a pea, and have a red, slightly elevated, hardish base. In two or three days after the appearance of the pustule, it is replaced by a scab, which adheres firmly to the base, and is somewhat concave. On its removal, a deep red mark, a new scab, an ulcer, or a healed scar remains. The disease may be acute or chronic. The acute form is ushered in by slight constitutional, not amounting to febrile, symptoms, and by a burning or pricking pain at the seat of the eruption, which is usually confined to the neck and shoulders. The disease runs its course in ten days or a fortnight. In chronic ecthyma, the pustules which follow in crops (often for several months) are usually scattered over the extremities. This form of eruption indicates a low state of the system. It sometimes follows the acute disease, and not unfrequently is a tertiary symptom of syphilis. Pustules, which in no respect seem to differ from those of ecthyma, are produced by various local irritants. Thus the affection of the hands, popularly known as *grocer's itch*, is produced by the irritation of brown sugar, perhaps by the *acari* often present in it. Stone-masons are said occasionally to suffer from a similar disease. With regard to *treatment*, the acute form would in most cases doubtless disappear in the course of a fortnight, if left entirely to itself; but as the bowels are usually disordered, an occasional aperient may be prescribed, and tepid water applied locally gives great relief. The patient should, moreover, be kept on a moderately good, nutritious diet. In the chronic form of the affection, a meat diet and the use of wine or porter are essential; while tonics, such as a combination of bark and nitric

acid are called for. Tepid baths are often useful, and if there is sleeplessness, an opiate may under medical direction be taken at or shortly before bedtime.

ECTOBLAST, n. *ĕk'to-blăst* [Gr. *ektos*, outside; *blastos*, a sprout, a shoot]: in *biol.*, the membrane composing the walls of a cell, as distinguished from those forming the mesoblast, the entoblast, and the entosthoblast.

ECTOCARPUS, n. *ĕk-to-kâr'pŭs* [Gr. *ektos*, without, outside; *karpos*, fruit. So called because the theca is not inclosed]: in *bot.*, species of fucoids, typical one of the family *Ectocarpidæ*.

ECTOCYST, n. *ĕk'to-sĭst* [Gr. *ektos*, outside; *kustis*, a bladder]: in *zool.*, the external investment of the cœnœcium of a polyzoon.

ECTODERM, n. *ĕk'tō-dėrm* [Gr. *ektos*, outside, *derma*, skin]: in *zool.*, the external integumentary layer of the cœlenterata, corresponding to the epidermis in man; the outer layer of cells into which the blastoderm is divided after the completion of the segmenting process.

ECTOPISTES, n. *ĕk-to-pĭs'tēz* [Gr. *ektopizō*, I move from a place]: in *ornith.*, genus of *Columbidæ*. *Ectopistes migratorius* is the Passenger Pigeon of North America.

ECTOSARC, n. *ĕk'to-sârk* [Gr. *ektos*, outside; *sarx* or *sarka*, flesh]: in *zool.*, the outer transparent sarcode-layer of certain rhizopods, such as the amœba.

ECTOZOON, n. *ĕk'tō-zō'ŏn*, Ectooza, n. plu. *ĕk'tō-zō'ă* [Gr. *ektos*, outside; *zōŏn*, an animal; *zōă*, animals]: parasitic animals which live upon the external parts of other animals, as lice, ticks, etc. Such also are many of the entomostracous crustaceans, parasitic upon fishes. The term ectozoon is in contradistinction to *Entozoa*. It is a question of much importance, not yet satisfactorily answered, if any of these creatures are the causes of diseased states, in connection with which they are sometimes found in particular abundance, or if their presence in unusual numbers is to be ascribed to disease previously existing.

ECTROPIUM, n. *ĕk-trō'pĭ-ŭm*, or Ectropion, n. *ĕk-trō'-pĭ-ŏn* [Gr. *ek*, out of; *trŏpē*, a turning]: a disease in which the eyelashes are turned outward; it can be remedied by a slight surgical operation.

ECTROTIC, *ĕk-trŏt'ĭk* [from Gr. *ectroma*, abortion]: a term applied to methods of medical treatment which aim at preventing the development of a disease.

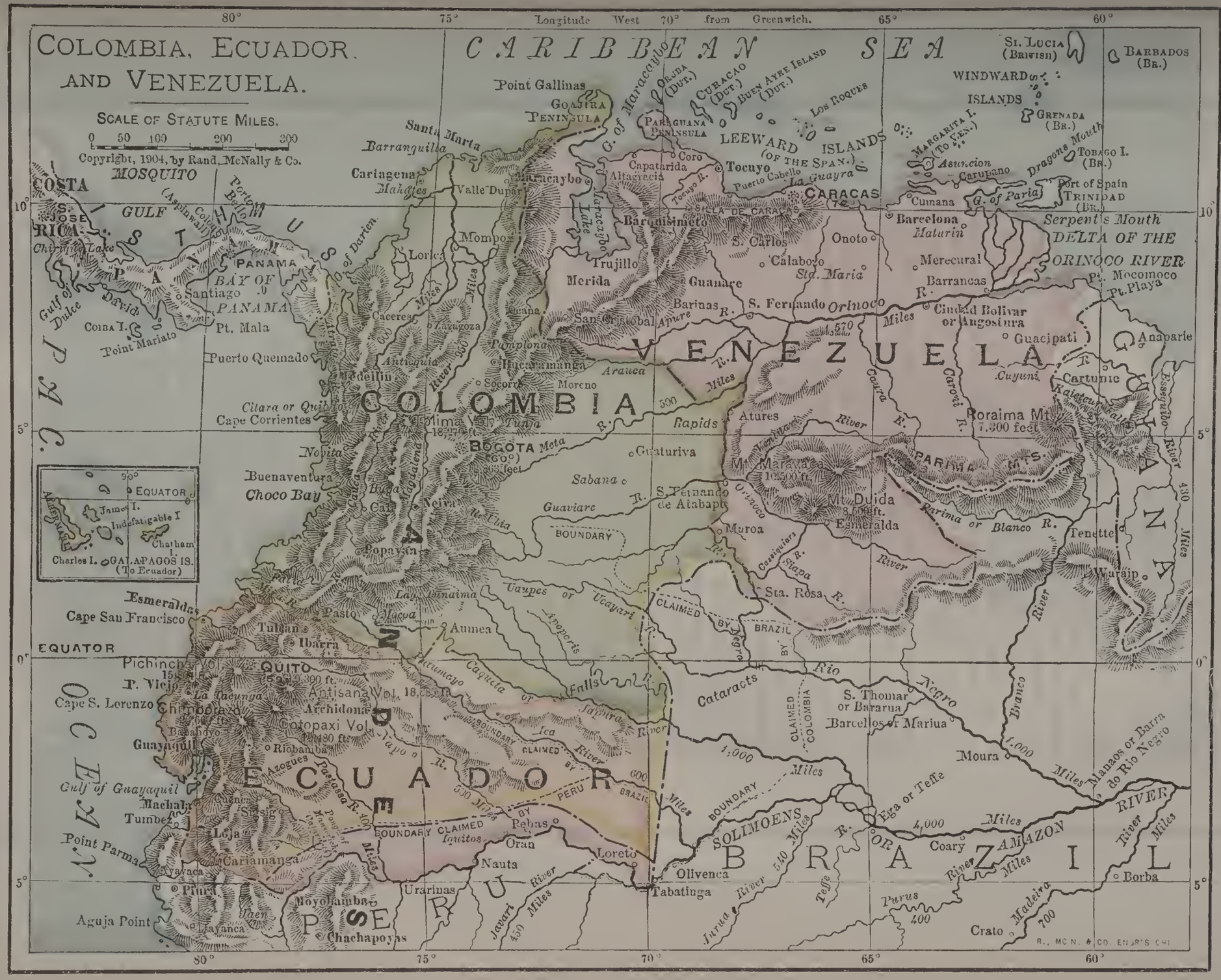
ECTYLOTIC, a. *ek-tĭ-lŏt'ĭk* [Gr. *ektulōtikos*, hardening into a callus; *tulos*, a knot, a callus]: in *med.*, applied to a remedy or substance having the power or property of removing callosities or indurations of the skin.

ECTYPE, n. *ĕk'tīp* [L. *ectypus;* Gr. *ektŭpŏs*, worked in high relief—from Gr. *ek*, out of; *tŭpŏs*, stamp, figure]: a copy from an original; a cast in relief of an ornamental design—sometimes called *Ectypum*. Ecty'pal, a. *-tī'păl*, taken from the original; copied. Ec'typog'raphy, n.

-pŏg′ră-fĭ [Gr. *grapho*, I write]: a method of etching by which the lines are raised on the plate instead of sunk in: see ETCHING.

ECUADOR, *ĕk-wâ-dōr′* [Spanish term for *Equator*]: independent state of S. America, extending from lat. 1° 40′ n. to 5° 50′ s.; and from long. 70° to 81° 20′ w.; length from n. to s. fully 500 m., and from e. to w. nearly 800; about 120,000 sq. m. It is bounded n. by the United States of Colombia, e. by Brazil, s. by Peru, and w. by the Pacific Ocean. Toward the e. it is drained by the Amazon, which receives all the rivers that flow down the e. slopes of the Andes, while the country w. of the Andes is drained chiefly by the Mira, the Esmerelda, and the Guayaquil—the last more available for navigation than any other stream on the w. coast of S. America. The country is traversed, nearly in a line of a meridian, by the two ranges of the Andes, which, alternating between union and separation, sometimes run into what are called knots, and sometimes inclose, at great elevation, plateaus or table-lands. Among these last, ranging from s. to n., the most important are those of Cuença, Hambato, and Quito—their respective heights above the sea being, 8,640, 8,860, and 9,543 ft. Lofty as these plateaus or table-lands are, they are beset, indeed almost shut out from the world, by pinnacles of occasionally more than equal altitude above their own level. Of these the most remarkable are Chimborazo and Cotopaxi (q.v.). In connection with these physical features, the country is subject to volcanoes and earthquakes—the latter frequently occurring, and the former numbering no fewer than sixteen. The climate comprises every possible variety. Hyperborean cold marks the snow-capped mountains; a temperature at once moderate and uniform renders the upland plains so many paradises; while, on both sides of the dividing ridge, intense heat oppresses the lower valleys. The rainfall is different in different localities. In the basin of the Guayaquil, there is regularly a wet season; between it and Cape San Lorenzo, almost perpetual drought prevails; and in the other direction, the upper tributaries of the Amazon are said to be fed by almost perpetual rains.

The chief cities are Quito, the capital, and Guayaquil, a great commercial emporium; and the towns of the second class, Cuença, Riobamba, Ambato, and Loja. The government appears to have been constituted on the model of the U. S. of N. America, having a pres. and vice-pres., with a senate and a house of representatives. The foreign trade of Ecuador is carried on chiefly through the port of Guayaquil. The imports (1900) were $6,715,585; exports $7,709,610. Revenue $3,812,915; expend. $3,331,470; principal exports are cocoa, the precious metals, vegetable ivory, cascarilla, caouchouc, coffee, straw hats, hides, etc. The principal articles of import, in order of value, are cottons, woolens, wines, spirits, groceries, soap and candles, hardware, flour. There were (1902) 90 m. of R. R. and but one wagon road of 115 m. Transportation is


COLOMBIA, ECUADOR AND VENEZUELA.
SCALE OF STATUTE MILES.
0 50 100 200 300
Copyright, 1904, by Rand, McNally & Co.
Longitude West from Greenwich.
80° 75° 70° 65° 60°
CARIBBEAN SEA
Point Gallinas
Goajira Peninsula
Santa Marta
Barranquilla
Cartagena
Maracaybo
G. of Maracaybo
Paraguana Peninsula
Coro
Capatarida
Altagracia
Tocuyo
Puerto Cabello
La Guayra
CARACAS
Valencia
Barquisimeto
S. Carlos
Onoto
Calabozo
Sta. Maria
Barcelona
Maturin
Cumana
G. of Paria
Port of Spain
TRINIDAD (Br.)
Tobago I. (Br.)
Grenada (Br.)
Windward Islands
Leeward Islands (of the Span.)
Curaçao (Dut.)
Aruba (Dut.)
Buen Ayre Island (Dut.)
Los Roques
Margarita I. (To Ven.)
Asuncion
Carupano
Dragons Mouth
St. Lucia (British)
Barbados (Br.)
Serpents Mouth
DELTA OF THE ORINOCO RIVER
Pt. Mocomoco
Pt. Playa
Merecural
Barrancas
Ciudad Bolivar or Angostura
Guacipati
Anaparle
Cartunic
Cuyuni
Roraima Mt. 7,300 feet
Atures Rapids
Mt. Maravaca 10,500 ft.
Parima Mts.
Mt. Duida 8,500 ft.
Esmeralda
Maroa
Tenette
Wuraip
Sta. Rosa
Casiquiare
Orinoco
Parima or Blanco R.
Rio Negro
Cataracts
S. Thomar or Bararua
Barcellos or Mariua
Moura
Manaos or Barra do Rio Negro
Coary
Borba
Crato
Olivenca
Tabatinga
Loreto
Nauta
Iquitos
Oran
Urarinas
Moyobamba
Chachapoyas
Pebas
Iça or Teffe
Solimoens
Amazon River
Jurua River
Purus
Madeira
Javari
Tunguragua
Pastaza R.
Napo R.
Aguarico R.
Putumayo R.
Caqueta or Japura River
Yapura R.
Vaupes or Uaçayari R.
Apoporis
Lake Maracaybo
Gulf of Darien
Gulf of Dulce
Gulf of Guayaquil
Point Parma
Aguja Point
Point Mariato
Coiba I.
Pt. Mala
Puerto Quemado
David
Santiago
Bay of Panama
Panama
Mosquito Gulf
Costa Rica
S. Jose
Chiriqui Lake
Caceres
Zaragoza
Lorica
Mompos
Trujillo
Merida
Barinas
San Cristobal
Guanare
S. Fernando
Orinoco
Pamplona
Bucaramanga
Arauca
Medellin
Antioquia
Socorro
Moreno
Citara or Quibdo
Cape Corrientes
Lima 18,000 ft.
Tuna
Bogota Mota (60°) 30° feet
Buenaventura
Choco Bay
Nonita
Buga
Cali
Yelva
Popayan
Guaviare
Sabana
Guaturiva
S. Fernando de Atabapo
Boundary
Esmeraldas
Cape San Francisco
Equator
Tulcan
Ibarra
Pasto
Mocoa
Aumea
Lagunaima
Pichincha Vol. 15,918 ft.
Quito 9,390 ft.
P. Vicja
Cape S. Lorenzo
La Tacunga
Antisana Vol. 18,
Archidona
Chimborazo 20,498 ft.
Cotopaxi Vol. 19,380 ft.
Riobamba
Guayaquil
Azogues
Cuenca
Sigsig
Machala
Tumbez
Loja
Cariamanga
Zaruma
Piura
Huancabamba
Jaen
Lafranca
Chachapoyas
Pebas
Iquitos
Oran
Nauta
Loreto
Urarinas
Olivenca
Tabatinga
Ecuador
Peru
Brazil
Colombia
Venezuela
Guiana
Claimed by Brazil
Claimed by Colombia
Boundary claimed by Peru
Boundary claimed by Brazil
Falls
Rapids
Miles
Equator
James I.
Indefatigable I
Chatham I
Charles I.
Galapagos Is. (To Ecuador)
R., McN. & Co. Engr's Chi

chiefly by pack animals, and on navigable rivers by means of 17 steamboats. There were 1,242 m. of telegraph. Pop. est. (1902) 1,205,600, of whom 100,000 were whites, 300,000 mixed race, and the remainder Indians of a mixed race.

ECUMENIC, a. *ĕk′ū-mĕn′ĭk*, or EC′UMEN′ICAL, a. *-ĭ-kăl*, also ŒCUMENIC, ŒCUMENICAL [mid. L. *œcumen′ĭcus*, universal—from Gr. *oikouměnĭkŏs* pertaining to the inhabitable earth, universal—from *oikĕō*, I inhabit]: general; universal; a term applied to those ecclesiastical councils regarded as representing the whole Christian Church, or the church of the whole world (*oikoumenē*) (see COUNCIL); and to the orthodox or Catholic Church, regarded as opposed to heretical and merely local sects. The Rom. Catholics claim the designation as appropriate to their own church, which claim the Greek Church and Protestants deny. The term was applied by the Eastern Church, after 587, to patriarchs and archbishops of provinces.

The conditions necessary to constitute an ecumenical or universal or general council are a subject of controversy, which in Rom. Cath. theology assumes importance. A council is said, by Rom. Catholic divines, to be ecumenical in three different ways; viz., in convocation, in celebration, and in acceptation. For the first, the summons of the pope, direct or indirect, is held to be necessary; this summons must be addressed to all the bishops of the entire church. To the second, it is necessary that bishops from all parts of the church should be present, and in sufficient numbers to constitute a really representative assembly: they must be presided over by the pope, or a delegate or delegates of the pope; and they must enjoy liberty of discussion and of speech. For the third, the decrees of the council must be accepted by the pope, and by the body of the bishops throughout the church, at least tacitly. The last of these conditions is absolutely required to entitle the decrees of a council to the character of ecumenical; and even the decrees of provincial or national councils so accepted may acquire all the weight of infallible decisions, in the eyes of Roman Catholics.

ECZEMA, n. *ĕk′zē-mă* [Gr. *ekzĕsis*, an eruption on the skin—from *ek*, out; *zĕō*, I boil]: disease of the skin characterized by an eruption of vesicles which break and discharge a sticky fluid, which dries and forms crusts and scales; usually attended with much itching and more or less swelling and infiltration of the skin. Eczema is the commonest of all skin diseases, and no period of life is exempt from it. The causes are constitutional and local. Constipation, imperfect digestion, mental anxiety by its effect on the digestive organs, overwork, and abuse of alcohol, are exciting causes. Eczema is produced often by the application of irritating substances to the skin, by excessive sweating, and too frequent washing with a harsh soap. Mechanical irritation, as rubbing and scratching, is an important cause at least of its extension. Eczema is sometimes complicated with other diseases, such as

gout, rheumatism, asthma, catarrh of the stomach, and boils. Occasionally, eczema and these diseases appear alternately; at other times they are coincident. This peculiar alternation, though not common, has given rise to a popular superstition that it is unwise to cure an eczema, as its cure will certainly be followed by some more alarming malady. This is an error; and the physician has to deplore the inefficiency of the curative agents rather than to dread their potency. Eczema is one of the most obstinate skin diseases, and often resists all treatment. In cases of acute eczema the first essential is a thorough evacuation of the bowels; this is best accomplished by a dose of Epsom salts or a glass of one of the natural purgative waters. Locally, nothing stimulating should be used—a simple water dressing is perhaps the most comforting and soothing. During an attack of eczema, washing the part affected must be abandoned, and in infantile eczema the daily bath must cease. Certain articles of food must be avoided, e.g., coffee, sugar, highly seasoned dishes, and pepper. Local treatment consists in protecting the part affected and applying a soothing ointment. A favorite prescription known as Lassar's paste is frequently prescribed; it consists of salicylic acid two parts, starch and zinc oxide 25 parts each, vaseline 50 parts. Medical advice should be had, as it is unwise to prescribe at random for such a hydra-headed malady as eczema, which, when extreme, becomes dangerous.

EDACIOUS, a. *ĕ-dā′shŭs* [L. *edax* or *edācem*, voracious—from *edo*, I eat]: eating; greedy; voracious. Eda′ciously, ad. *-lĭ*. Edac′ity, n. *-dăs′ĭ-tĭ* [L. *edācĭtas*, voracity]: greediness; rapacity.

EDAM, *ā-dâm′:* town in n. Holland, 12 m. n.n.e. of Amsterdam. There is an extensive trade in wood and cheese. The principal industries are shipbuilding, rope-spinning, sawing wood, tanning leather. Pop. (1891) 6,424.

EDAPHODONT, n. *ē-dăf′odŏnt* [Gr. *edaphos*, bottom foundation; *odontos*, tooth]: in *paleon.*, a genus of fishes, family *Chimæridæ;* range, from the Cretaceous rocks to the Eocene.

EDDA, n. *ĕd′dă*, Ed′das, plu. [Icel. *edda*, great-grandmother—viz., of Scandinavian poetry]: the two religious or mythologic books of the old Scandinavians—the *Edda Sæmundar hins Froda*, or Edda of Sæmund the Wise; and the *Edda Snorra Sturlusonar*. The former and older of these is a collection of the most ancient mythological and heroic Scandinavian songs, referable probably to different periods between the 8th and 11th c. These songs, supposed to have been collected and arranged by Sæmund Sigfusson, surnamed Frodi, an Icelandic priest (1054–1133), were discovered and first brought to the notice of European scholars in 1643, by Brynjulf Sveinsson, bp. of Skalholt, who applied to them the name of Edda, or 'grandmother.' This collection was published entire at Stockholm, 1818,

by A. A. Afzelius, after the text of Prof. Rask; and at Copenhagen, 1787–28, with a Latin translation, glossaries, etc. The third vol. of this edition, completed by Prof. Finn Magnusen, consists chiefly of a very learned and copious Lexicon Mythologicum by the editor. Complete editions of the text of this Edda were published also by Munch and Möbius, but former editions were superseded by the editions of Prof. Bugge of Copenhagen (1867) and of Grundtvig (1874); still more by the *Corpus Poeticum Boreale* of Vigfusson and Powell (1883). Simrock made a German translation of both Eddas 1851; and both Ettmüller and the brothers Grimm have translated a part of the 'Elder' Edda. The Snorra Edda is a prose composition, and treats of Scandinavian mythology and of the language and modes of composition of the ancient skalds. As the name implies, it is referred to Snorri Sturluson (q.v.) the learned author of the *Heimskringla*, born Iceland 1178 and died by assassination 1241, on his return from Norway where he had lived in the capacity of skald or court-poet. This Edda was published first by P. J. Resen 1665, under the title *Edda Islandorum An. Chr.* MCCXV. *Conscripta per Snorronem Sturlæ*, etc. A complete edition of the prose Eddas, and the most copious of all, was published at Stockholm by Prof. Rask 1818. The trustees of the Arna-Magnæan legacy in Copenhagen have published an elaborate edition with a Latin translation and notes; and a German edition of both Eddas, with glossary, etc., was published 1859 by Lüning. A complete English translation of the poetical Eddas, by Ben. Thorpe, was published 1866. The younger Edda was translated by Blackwell in his edition of Mallet's *Northern Antiquities* (1847), and by Prof. Andersen of Wisconsin (1880).

EDDISH, n. *ed'dĭsh* [a corruption of *eatage;* Fris. *etten*, to pasture]: the pasturage or eatable growth of either grass or corn field; the second crop or aftermath.

ED'DOES: see Cocco.

EDDY, n. *ĕd'dĭ* [Icel. *yda*, a whirlpool—from *yda*, to boil: AS. *yth*, a wave, a flood: comp. Gael. *ath*, back; *teich*, to flow]: a current of water or air contrary to the main stream; a circular motion of water; a whirlpool: V. to move, as an eddy. Ed'dying, imp. Ed'died, pp. *-dĭd.*

EDDY, Daniel Clarke, dd.: 1823, May 1—1896, July 26; b. Salem, Mass. He graduated at New Hampton, Theol. Inst., N. H., 1845, and the following year was ordained pastor of the first Baptist Church, Lowell, Mass., where he remained 10 years. In 1854, he was elected a member of the Mass. legislature by the 'Know Nothing' party, and was made speaker. After 1856, he occupied pulpits in Boston, Fall River, Philadelphia, and Brooklyn. He made two visits to Europe, travelling through Palestine and Turkey. He is the author of *Young Man's Friend*, (1849); *The Burman Apostle* (1850); *Europa*

(1851); *The Percy Family* (1852); *Angel Whispers* (1853); *Heroines of the Missionary Enterprise* (1854); *City Side* (1854); *Walter's Tour in the East* (1861).

EDDY, Mary Baker Glover: author and founder of the Christian Science denomination: b. at Bow, near Concord, New Hampshire, 1821. She was educated in the public schools of her native place and by private tutors. She removed to the South, where she was married to Col. George W. Glover, of Charleston, S. C. In 1877, she married Dr. Asa G. Eddy. She claims to have discovered Christian Science (q.v.) in 1866, and commenced teaching it the following year. In 1879 she founded the first C. S. church at Boston, was ordained to the ministry in 1881, and the same year founded the Massachusetts Metaphysical College at Boston. In 1833 she founded the *Christian Science Journal*, but is most widely known as author of *Science and Health, with Key to the Scriptures* (1875), which gives an interpretation of the Scriptures from the Christian Science point of view. Among her other publications are: *Christian Healing* (1886); *People's Idea of God* (1886); *Rudimental Divine Science* (1891); *Retrospection and Introspection* (1892); *Truth versus Error* (1905); etc.

EDDY, Henry Turner: author and mathematician: b. Stoughton, Mass., 1844, June 9. He was graduated at Yale College 1867, and was assistant professor of mathematics and civil engineering in Cornell University 1869–73; professor of mathematics, astronomy and civil engineering in the University of Cincinnati 1874–90; president of Rose Polytechnic Institute, Terre Haute, Ind., 1891–4, and in the latter year he accepted the chair of engineering and mechanics in the University of Minnesota. Among his publications are: *Analytical Geometry* (1874); *Researches in Graphical Statics* (1878); *Maximum Stresses under Concentrated Loads* (1890).

EDDY, Clarence: musician: b. Greenfield, Mass., 1851, June 23. In 1876 became general director of the Hershey School of Musical Art in Chicago. He has published *The Church and Concert Organist; The Organ in Church: Concert Pieces for the Organ*, etc.

EDDY CURRENTS: Electric currents which are set up in the iron framework or pole-pieces of dynamo-electric machines, or which sometimes are produced in large conductors. These currents traverse local circuits—as in a mass of iron—and serve no useful purpose, but on the contrary, waste energy and increase the heating of electrical machinery. See Electricity, Principles of, and Electrical Machines. See Electrical Machines.

EDDYSTONE, *ĕd'dĭ-stōn:* group of gneiss rocks, daily submerged by the tide, in the English Channel, 9 m. off the Cornish coast, 14 m. s.s.w. of Plymouth Breakwater, lat. 50° 10′ 54″ n., and long. 4° 15′ 53″ w. The rocks have 12 to 150 fathoms of water around. The frequent shipwrecks on these rocks led to the erection of a light-

house on them by Mr. Winstanley, 1696–1700. It was a wooden polygon, 100 ft. high. with a stone base; but a storm in 1703 completely washed it away, with the architect. Another light-house was built, 1706–09, also of wood, with a stone base, and 92 ft. high, by Mr. Rudyerd, a silk-mercer. This erection was burned 1755 The next. noted for its strength and the engineering skill displayed in it, was constructed by Alfred Smeaton in 1757–59, on the model, it is said of the trunk of the oak-tree. It was built of blocks, generally one to two tons weight, of Portland oolite, encased in granite. The granite was dove-tailed into the solid rock, and each block into its neighbors. The tower, 85 ft. high, had a diameter of $26\frac{3}{4}$ ft. at the base, and 15 ft. at the top. The light, 72 ft. above the water, was visible 13 miles. As the rock on which this tower was built is worn and greatly weakened, the foundation of another was laid on another part of the reef in 1879. The new light-house, completed 1882, is, like its predecessor, ingeniously dove-tailed throughout. Its dioptric apparatus gives, at an elevation of 133 ft., a light equal to 159,600 candles, and visible in clear weather $17\frac{1}{2}$ miles. On account of the state of the foundation, Smeaton's light-house was taken down as soon as the new one was completed, and removed for re-erection on Plymouth Hoe. See LIGHT-HOUSE.

EDELFORSITE, n. *ĕd'ĕl-fawr-sīt* [Ger. *œdelforsit*—from *Ædelfors*, in Sweden, where it is found]: a transparent mineral of a white or grayish color regarded by some as an impure wollastonite.

EDELINCK, *ĕd'ĕl-ĭnk* or *ā'dĕh-lĭnk*, GERARD: 1627–1707, b. Antwerp: engraver. He was patronized by Louis XIV. and died in Paris.

EDELWEISS, *ā'del-vīs* [Eng. noble purity]: *leontopodium alpinum*, lion's-foot: native of high sloping pastures on many parts of the great European mountain-ranges. It is a hardy perennial, growing 4 to 8 in. high, and bearing small, yellowish flowers above a beautiful whorl of oblong leaves which are almost covered with pure white, dense, short down. It is indigenous to the Alpine region, and is plucked by tourists as an evidence of their prowess in mountain-climbing. Within a few years tourists have been forbidden to pick either flowers or leaves, because of the vandalism that was rapidly causing its disappearance from the mountain-sides. Great quantities have been sold by florists in some large European cities.

EDEMA, or ŒDEMA, n. *ē-dē'mă* [Gr. *oidēma*, a swelling]: in *med.*, a minor form of dropsy, consisting of puffiness of a part arising from the effusion or infiltration of serum into cellular or areolar structures. EDEM'ATOUS, a. *-dem'ă-tŭs*, having edema; dropsical; full of humor. *Edema* has its most frequent but not its only seat in the subcutaneous cellular tissue. It is observed occasionally in the submucous and subserous cellular tissue, and in the cellular tissue of the parenchymatous viscera; and in some of these cases it gives rise to symptoms which admit of

easy recognition during life. Thus edema of the glottis (see LARYNX) and edema of the lungs constitute well-marked and serious forms of disease; while edema of the brain, though not easily recognized during life, is found in many *post-mortem* examinations of insane patients.

Edema may be either passive or active, the former being by far the most frequent. *Passive edema* arises from impeded venous circulation (as from obstruction or obliteration of one or more veins; from varicose veins; from standing continuously for long periods, till the force of the circulation is partly overcome by the physical action of gravitation; from deficiency in the action of the adjacent muscles, which in health materially aids the venous circulation, etc.); from too weak action of the heart (as in dilatation or certain forms of valvular disease of that organ); or from a too watery or otherwise diseased state of the blood (as in chlorosis, scurvy, Bright's disease, etc.). Through the knowledge derived from pathological anatomy, the cause can often be inferred from the seat of the swelling; e.g., edema of the face, beginning usually with the eyelids, is commonly caused by obstruction to the circulation through the left side of the heart, or by the diseased state of the blood in Bright's disease; and edema of the lower extremities commonly arises from obstruction in the right side of the heart, unless it can be traced to the pressure of the gravid uterus, or of accumulated fæces in the colon, or to some other local cause.

Active edema is associated with an inflammatory action of the cellular tissue, and is most marked in certain forms of erysipelas. It is firmer to the touch, and pressure with the finger produces less pitting than in the passive form.

From the above it will be seen that edema is not a disease, but a symptom, and often a symptom indicating great danger to life. The means of removing it must be directed to the morbid condition or cause of which it is the symptom.

EDEN, *ē'dĕn:* river rising in the e. of Westmoreland, in the Pennine Chain, England. It runs n.n.w. through the e. of Westmoreland and Cumberland, past Appleby and Carlisle, and ends a course of 65 m. in a fine estuary at the upper part of the Solway Firth.

EDEN, n. *ē'dĕn* [Heb. *eden*, delight]: a place of delight: a paradise, a garden.—*Eden*, according to the Hebrew Scriptures, was the first residence of man. The description in Genesis is brief and obscure. For the allegorical theory. see FALL. In general, notwithstanding features in the narrative plainly figurative, and other features which cause various writers to class it as legendary, scholars still are not lacking who accept the story as a grand outline of facts in an inspired vision fitly cast in pictorial and dramatic form. See COSMOGONY. It is agreed that the locality of Eden is unknown. Josephus with other Fathers conceived that Eden meant all the region between the Ganges and Nile; Calvin, Huet, Bochart, Wells, etc., have, with slight differences of detail, concluded in favor of Kornah

in Babylonia, not far from the Persian Gulf; Reland, Calmet, Hales, Faber, J. Pye Smith, in favor of Armenia, near the sources of the Tigris and Euphrates; Le Clerc, in favor of the region near Damascus; while the modern German school of biblical critics, convinced that the Hebrew account is traditional, and, in its present form, of late composition, and impressed, besides, with the vast antiquity of the far East, have, almost without exception, turned their eyes in that direction, and sought the cradle of the human race in Bactria or Cashmere, or the region n. of it, a part of which is to this day called Audyana, the 'Garden.' An ingenious recent theory is that Eden was in the North Polar region—astronomical arguments being adduced to show that in far ancient ages that was the region of warmth and luxuriance. Mohammedans believe Eden to have been in one of the seven heavens—some say the moon—and that the expulsion from paradise consisted in Adam being cast down upon the earth after the fall. It is useless seeking to identify the river-system of Eden with anything known at present. It is said that there is no river on the face of the globe of which the Euphrates and Tigris (Hiddekel) were anciently separate 'heads' (whether this means 'sources' or 'channels'), as they are said to be, Gen. ii.; for, as Major Rennel has shown, though the Euphrates and Tigris *now* unite for a short space on their way to the Persian Gulf, yet, until the time of Alexander the Great, they kept entirely distinct courses; and therefore it has been assumed that the 'Deluge' completely altered the physical character of the region denoted by the term Eden. This was Luther's notion, to which, however, it has been objected, that the narrative in Genesis is so worded as to convey the idea that the countries and rivers spoken of were still existing in the time of the historian. To this objection the reply might be made that in an antiquity prior to the time of Alexander, the rivers might have had their course similar to the present. More important is the consideration that the science of geology has thrown so much doubt on the literal universality of a Deluge so late as the period assigned to Noah, that it is hazardous to argue on the hypothesis of world-wide changes. For an ingenious argument for the 'lost Atlantis' as the original scene destroyed by a great submergence, see *Atlantis*, by Ignatius Donnelly. The locality of Eden, or of the exact sense in which the Mosaic narrative of it is to be understood, is involved in mystery; and it has become a general opinion, that the spiritual significance of this primeval story is chiefly to be sought—an opinion which derives force from the manner of the New Test. reference to the subject. See GENESIS.

EDENITE, n. [from *Edenville*, where it occurs]: a variety of aluminous magnesia-lime-iron amphibole, pale in color, and containing less than 5 per cent. of oxide of iron.

EDENKOBEN, *ā'dėn-kō-bėn:* town of the Bavarian Palatinate, six m. n.n.w. of Landau. It is surrounded by vineyards, which produce much poor wine. There is a

bathing establishment at Edenkoben, also several mills. Pop. 4,914.

EDENTA'TA: order of *Mammalia* established by Cuvier, and generally received by naturalists. Cuvier remarks, that 'although brought together by a purely negative character,' the Edentata have, nevertheless, 'some positive mutual relations, particularly in the great claws which encompass the ends of their toes, and which more or less approximate to the nature of hoofs; also in a certain slowness or want of agility, obviously arising from the peculiar organization of their limbs.' He included among them, however, the *Monotremata*, which, though so few in number, are now generally separated, on account of the very important differences of organization which characterize them. The remaining Edentata are divided into two tribes—1. *Tardigrada* (slow-paced), containing only the sloths; and, 2. *Effodentia* (diggers), containing armadillos, pangolins, ant-eaters, etc. The ant-eaters and pangolins are the only Edentata that are absolutely destitute of teeth; but none of the order have any teeth in the forepart of their jaws; and their teeth are comparatively imperfect in structure, being destitute of enamel and distinct roots. The sloths alone subsist on vegetable food, the rest chiefly on insects or on animal substances in a decaying state. The whole number of existing species of Edentata is not great; but they appear to have been more numerous and of much greater size in a former geological period, as the remains of the *Mylodon*, *Megatherium*, and *Megalonyx* testify.

EDENTATE, a. *ĕ-dĕn'tāt*, or EDEN'TATED, a. [L. *edentātus*, rendered toothless—from *e*, without; *dentem*, a tooth]: without teeth; deprived of teeth; without front teeth. E'DENTA'TA, n. *-tā'tă*, an order of quadrupeds, including the sloths and ant eaters, so called because they agree in being destitute of front or incisor teeth. EDEN'TULOUS, a. *-tū-lŭs*, toothless.

EDENTON, N. C., town, county-seat of Chowan co.; on the Albemarle Sound, near the mouth of the Chowan River; on two branches of the Norfolk, Va., B. & S. R.R.; about 90 m. n. of Beaufort and 115 m. n.e. of Raleigh. Four steamship lines enter Edenton, thus making it a good shipping point for the trade of the n.e. part of the State. The shallow waters of the Albemarle Sound are a hindrance to more extensive shipping. The name given to the town when founded in 1712 was Queen Anne's Creek, but this was changed to Edenton in honor of a governor of the colony, Charles Eden. In less than one year after the 'Boston Tea Party' a number of the housewives of Edenton resolved not to assist in supporting England by paying a tax on tea; and they formed themselves into an organization, none of whose members should drink tea. In addition to being first among those who held Revolutionary tea parties, they seem to have been pioneers in America in the formation of organizations for women. The chief industries are lumbering and fishing. Pop. 3,280.

EDES, Robert Thaxter, American physician: b. Eastport, Maine, 1838, Sept. 23. He was graduated at Harvard 1858, and at the Harvard Medical School 1861; served as surgeon in the United States navy 1861–5; was professor of materia medica 1870–84; and professor of clinical medicine 1884–6 at the Harvard Medical School. He was physician at the Boston City Hospital 1872–86, and at the Garfield Memorial Hospital, Washington, 1889–91, and resident physician at the Adams Asylum 1891–7. Among his works are: *Nature and Time in the Cure of Diseases* (1868); *Physiology and Pathology of the Sympathetic or Ganglionic Nervous System* (1869); *Therapeutic Handbook of the United States Pharmacopœia* (1883); *Therapeutics and Materia Medica* (1887); and many contributions to medical journals at home and abroad.

EDESSA, *ē-dĕs'sâ* (modern name, *Urfah*, or *Orfa*): very ancient city, on the river Daisan, in the n. of Mesopotamia, 78 m. s.w. of Diarbekir. The Christian or Mohammedan legend, ascribing its foundation to Nimrod, or Khabiba, a female contemporary of Abraham, is unworthy of credence. With the conquest of Persia by the Greeks, the history of Edessa first becomes clearer. Seleucus, in particular, is said to have done much for the aggrandizement of the city. Christianity was introduced into Edessa at an early period. In the reign of Trajan, the place was made tributary to Rome, and in 216 became a Roman military colony, under the name of *Colonia Marcia Edessenorum*. During this period, its importance in the history of the Christian Church increased. More than 300 monasteries are said to have been included within its walls; it was the seat of Ephraem Syrus and his school, and had an important part in the Arian and other controversies. With the extension of the religion of Islam, Edessa fell into the hands of the Arabian caliphs. Christianity declined, and wars at home and abroad during the caliphate, destroyed likewise its temporal splendor and prosperity, till in 1040 it fell into the possession of the Seljuk Turks. The Byzantine emperors succeeded in recovering Edessa, but the viceroy contrived to make himself independent. He was, however, hard pressed by the Turks, and this rendered it easy for the crusader Baldwin, the brother of Godfrey of Bouillon, to gain possession of the city (1097), and make it cap. of a Latin principality, and the bulwark of the kingdom of Jerusalem. Under the Frankish princes, Edessa held out valiantly against the Mussulmans, till at length Zengi, ruler of Mosul, succeeded in taking the town and citadel 1144, when all the Christian churches were converted into mosques. An attempt made by the inhabitants to throw off the Turkish yoke, completed the ruin of Edessa; the Edessenes were defeated by Nur-ed-din; and all not massacred were sold as slaves. After many vicissitudes, in the course of which Edessa fell successively into the hands of the sultans of Egypt, the Byzantines, the Mongols, Turkomans, and Persians, the city was finally conquered by the Turks,

and has ever since formed a portion of the Turkish dominions. At present Edessa has numerous mosques and bazaars, manufactures of cotton goods, goldsmith's wares, and morocco leather, commerce in British manufactures, obtained by way of Aleppo, and a large trade in corn, etc., with Syria. Edessa is regarded by the Easterns as a sacred city, because they believe it to have been the residence of Abraham. Pop. 55,000, of whom 2,000 are Armenian Christians; the rest are Turks, Arabians, Kurds, and Jews.

EDFOU, *ĕd'fô* (Coptic, *Atbô;* Egypt. *Hut;* anc. *Apollinopolis Magna*): town of Upper Egypt, on the left bank of the Nile, lat. 25° n., and long. 32° 45′ e. It contains the remains of two temples, considered the finest remains of antiquity in Egypt. The larger of these temples was commenced by Ptolemæus Philometor B.C. 181, but does not appear to have been completed till the reign of Claudius. There appears, however, to have been a temple there in the reign of Thothmes III. Its length is about 450 ft., breadth 250. Its entrance is by a gateway 50 ft. high, between two immense truncated pylones, 37 ft. wide at the base, and 114 ft. high. These are adorned with masterly sculptures. Passing through this entrance, the court is reached; it is 161 ft. long, and 140 ft. wide, inclosed by a splendid colonnade of 32 pillars, each differing in design, and surrounded by walls, between which and the pillars there is a stone roof, forming a covered portico. The interior of this court is to a great extent filled up with rubbish, and occupied by wretched dwellings, many of which also are built upon the roof of the temple. Within the temple, there are several chambers, one of which, about 33 ft. by 17, contained the image of the deity; in it was also a zodiac. The effect of the whole is grand and imposing, impressing the mind with the harmony and beauty of the design. An inscription of the outer wall recorded the endowment of the temple by Ptolemy Alexander I., and Darius, Nectanebo, and Nectanebes II. The smaller temple, erected by Physcon and Lathyrus consists of only two chambers. Its walls are covered with hieroglyphics representing the life of *Horus*, the son of *Kneph and Athor*, who were worshipped in the great temple. These temples have been lately entirely cleared by Mariette. Edfou now has some manufactures of blue cotton cloths, and earthenware similar to the ancient Egyptian pottery. Pop. abt. 2,000.

EDGAR, James David, Canadian statesman: b. Hatley, P. Q., 1841, Aug. 10. He was admitted to the bar 1864, first practising in Toronto; was made a Q.C. by the Ontario government in 1890. In 1872 he was elected to Parliament for Monck, being chief Liberal 'Whip'; served on a political mission to British Columbia, and was re-elected from West Ontario 1884. He was elected speaker of the commons in the new parliament 1896, and was instrumental in passing the Canadian Copyright Act 1889. Later he devoted much attention to the question of

international arbitration. He was elected a Fellow of the Royal Society of Canada 1897. He has published: *The White Stone Canoe* (1887); *This Canada of Ours and Other Poems* (1893); an *Annotated Edition of the Insolvent Law* (1864); and several other law books.

EDGE, n. *ĕj* [AS. *ecge;* Icel. *egg;* Dut. *egghe*, an angle, an edge: Ger. *ecke*, a corner: Gr. *ăkē*, a point, an edge]: the extreme border of anything; brink; verge; the thin cutting part of a knife, etc.; keenness; sharpness of mind or appetite, in *Britain*, the highest part of a moorish and elevated tract of ground, of considerable extent, generally that which lies between the streams; a kind of ridge. It is used alone and in combination, as in Caverton-edge. V. to sharpen; to furnish with an edge; to border or fringe; to move gradually; in *OE.*, to incite; to provoke. EDG'ING, imp. inciting; moving gradually or sidewise. N. a narrow lace; trimming added to a garment for ornament; in *gardening*, an outside row of plants, or a border of stone or wood, or an ornamental wire-work or wicker-work, or sometimes a narrow line of turf. EDGED, pp. and a. *ĕjd*, furnished with an edge or border; sharp; keen. EDGE'LESS, a. not sharp; blunt. EDGEWISE, ad. in direction of the edge; sidewise. EDGE-MILL, n. an ore-grinding or oil mill in which the stones travel on their edges. In addition to the crushing action, the edge-mill has a frictional or grinding action. EDGE-PLANE, n. plane for edging boards, having a fence, and a face with the requisite shape, flat, hollow, or round; also a plane for shaving the edges of boot and shoe soles. It has a knife curved to the shape desired, a projecting edge which forms a guide and gauge, and means for adjustment. EDGE-RAIL, n. form of rail for railroads, which bears the rolling stock on its edge. It is distinguished by its name from the flat-rail, which was first used; the angle-rail, which succeeded that, the bridge-rail, which presents an arched tread and has lateral flanged feet; the foot-rail, which has a tread like the edge rail, but, unlike it, has a broad base formed by foot-flanges. Also a rail placed by the side of the main rail at a switch to prevent the train from running off the line when the direction is changed. EDGE-TOOL, a cutting instrument. EDGE-WHEEL, n. a wheel traveling on its edge in a circular or annular bed, as in the ancient Phœnician oil-mills, the Chilian ore-mills, and many other crushing-mills. TO SET THE TEETH ON EDGE, to cause a grating or tingling sensation in the teeth. TO EDGE IN, to get in; to slide in.

EDGECUMBE: mountain in what was formerly Russian America, now Alaska, marks the n.w. point at the mouth of Norfolk Sound which lies between the settlement of New Archangel on the island of Sitka and the open ocean. It rises from the water's edge an almost perfect cone, which during nearly the whole year is capped with snow. It has been an active volcano within the recollection of some of the Russian colonists.

EDHEM PASHA: a Turkish soldier and diplomatist; b. 1823; entered the army and rose to the rank of colonel.

He became minister of foreign affairs, with the rank of Muchir; was ambassador at different European courts for eight years; succeeded Midhat Pasha as grand vizier in 1877; and commanded the Turkish forces in the Greco-Turkish war of 1896-97.

EDGEHILL, *ĕj'hĭl*, Battle of: first great battle of the civil war at the period of the English commonwealth; 1642, Oct. 23, Sunday, between the royalist forces under Charles and the parliamentarians under the Earl of Essex. It was the intention of Charles, who had been lying at Shrewsbury, to march upon London by Wolverhampton, Birmingham, and Kenilworth; and Essex, who had thrown himself into Worcester, on being informed of the king's plans, marched forward to intercept him, and entered the village of Keinton, in Warwickshire, on the evening of the 22d. On the following morning, the royalist army was discovered a little in advance, and drawn up in order of battle on the elevation of Edgehill. The king's forces had the advantage in numbers and in cavalry, as well as in position; Essex, however, had the more formidable train of artillery. Charles had commanded that hostilities should be delayed until the enemy should open fire; accordingly no movement took place till about two o'clock, when Essex commenced the fight by firing upon the royalists, who immediately replied with their cannon. The royalists then began to descend the hill, and Prince Rupert, who led the right wing, charged with his cavalry the left wing of the parliamentarians, broke it, and pursued it madly to Keinton, where his men, regardless of the main army, busied themselves in plunder. This was the fatal movement of the day. The right wing of the parliamentarians had charged and recharged with the greatest success, until, after some stubborn fighting around the royal standard, the royalists broke and retreated toward the hill. That night 4,000 men lay slain at the foot of Edgehill, the greater number royalists.

EDGEWATER, *ĕj'waw-tẽr:* village of Richmond co., Staten Island, N. Y., in the tps. of Middletown and Southfield; on New York Bay; at Vanderbilt station on the Staten Island railroad, adjoining Stapleton. It contains an acad. and several schools and churches, 1 savings bank, and numerous manufactories, of which those of candles, felt, hats, carriages, paper, and machinery are the most important.

EDGEWORTH, *ĕj'wėrth*, Maria: 1767-1849, May 21, b. Hare Hatch, near Reading, Berkshire, England; daughter of Richard Lovell Edgeworth (1744-1817), of Edgeworthstown, county of Longford, Ireland. In 1782, her father returned to Ireland, accompanied by his family, to whose education he devoted himself. Maria's talents quickly developed. Her first literary effort was written in conjunction with her father, and was entitled *Essays on Practical Education* (1798). In 1801 appeared the *Essay on Irish Bulls*, also in part the work of Mr. Edgeworth

But in the sphere of fiction Miss Edgeworth won her greatest triumphs. In 1801 she published *Castle Rackrent,* the first of an extensive series of novels characterized in general by a quiet agreeable humor, excellent sense, and lively delineation of character and manners. It has been objected by critics, however, that some of them are too manifestly didactic to please as fiction should please. In 1803 appeared *Belinda;* 1804, *Popular Tales;* 1806, *Leonora;* 1809, *Tales of Fashionable Life;* 1812, a second series of the same. The last of the series was 'Helen,' 1834. Among the most successful of her *Tales of Fashionable Life* were 'Ennui' and 'The Absentee.' Miss Edgeworth's stories for children—the last of which, *Orlandino,* appeared in *Chamber's Library for Young People*—are deserving of high praise. This gifted authoress died at Edgeworthstown.

EDGREN, August Hjalmar, Swedish-American educator: b. Wermland, Sweden, 1840, Oct. 18. He came to the United States in 1860, joined the 99th New York Regiment as second lieutenant January 1862; and in August 1863 entered the engineer corps. He was connected with Yale University 1874-80, and since 1893 has been professor of Sanskrit and linguistic science at the University of Nebraska. His numerous publications include a Swedish work on the *Literature of America* (1878); *Swedish Literature in America* (1883); and *American Antiquities* (1885); besides many valuable papers for students pertaining to Sanskrit, romance, and Germanic philology.

EDIBLE, a. *ĕd′ĭ-bl* [mid. L. *edĭb′ĭlis,* eatable; *edĭbĭl′ĭă,* things that may be used as food—from L. *edo,* I eat]: fit to be eaten as food; eatable. Edibility, n. the quality of being edible or eatable; edibleness. Edibleness, n. the quality of being edible or fit for food. Ed′ibles, n. plu. *-blz,* things fit to be eaten as food.

ED′IBLE BIRDS' NESTS, or Edible Swallows' Nests: see Nests, Edible.

EDICT, n. *ē′dĭkt* [L. *edictum,* a thing proclaimed—from *e,* out; *dictus,* said, spoken]: the written command or order of a sovereign; a decree; a proclamation having the force of law. The power of making edicts (*jus edicendi*) belonged generally to the higher magistrates at Rome; but was prominently exercised by the curule ædiles, and more extensively still by two prætors—the *prætor urbanus,* and the *prætor peregrinus.* In a province, the jurisdiction of the prætor passed to the *præses.* As this power was coextensive with the possession of what were called the honors (*honores*), it was frequently spoken of as the *jus honorarium;* and from its being exercised chiefly by the prætors, it was known also as the *jus prætorium.* The edicts of the prætors are mentioned by Gaius among the sources of the Roman law; but, strictly speaking, they are to be considered as rules promulgated by the magistrates on entering on office, rather than as expressions of the will of

the Roman people, either direct or indirect. The edict of one prætor was not binding on his successor, but very often edicts were adopted and confirmed, and this came gradually to constitute a very important body of law. They were frequently known by the names of their first promulgators, though they were named often with reference to the formula and the *actio* which they established. The power of promulgating edicts is supposed to have flowed down from the kings to the consuls, and through them to the prætors, and thus to have formed part of what in modern times is termed the royal prerogative. Even in Cicero's time, the study of the edicts had become a regular branch of the study of the law. In B.C. 67, the Lex Cornelia provided against the abuse of passing edicts for the decision of particular cases by requiring the prætors to decide in conformity with the edicts which they promulgated with reference to their whole tenure of office, which were known as perpetual edicts. Servius Sulpicius, friend of Cicero, addressed to Brutus a work on the subject; and Ofilius made what was probably a compilation of the various edicta, resembling the subsequent one by Julian. The object of the edict, according to the Roman jurists, was to aid, supplement, and correct the civil law, and to render it more conducive to the public service; and they speak of it as 'the living voice of the civil law.' It was, in short, an indirect form of legislation, which public opinion had sanctioned for the public convenience; and there can be no doubt that it contributed what was ultimately the most valuable part of the Roman law. There were many commentators on the edicts under the emperors, among whom Labeo is mentioned and cited by Ulpian (*Dig.* 4, tit. 3, s. 9). Julian is supposed to have collected and arranged the edicts, and given them a systematic form. Gaius, Ulpian, and Paulus composed treatises on the edicts of the curule ædiles; and it is chiefly from the writings of these and the other jurists excerpted in the *Digest*, that we know anything of the character of the edict, the portions of it which have been preserved being mere fragments. They have been collected by Wieling in his *Fragmenta Edicti Perpetui* (Frank. 1733).—Syn. of 'edict': law; decree; ordinance, statute; regulation; manifesto; proclamation; command; order.

E'DICT OF NANTES: see Nantes.

EDIFY, v. *ĕd'ĭ-fī* [F. *édifier*, to build, to instruct—from L. *ædĭfĭcārĕ*, to build—from *ædēs*, a house; *făcĭō*, I make—*lit.*, to build]: to instruct and improve the mind. Ed'ifying, imp.: Adj. instructing; improving. Ed'ified, pp. *-fīd*, instructed; improved. Ed'ifier, n. *-fī'ẽr*, one who Ed'ifyingly, ad. *lĭ*. Ed'ifica'tion, n. *-fĭ-kā'shŭn*, a building up or improvement of the mind in faith and holiness; instruction; improvement in any kind of knowledge. Ed'ifice, n. *-fĭs*, a large or splendid building; a large structure. Ed'ifi'cial, a. *-fĭsh ăl*, respecting the appearance of an edifice.—Syn. of 'edifice': building; structure; fabric; construction; house; pile.

EDINBURGH.

1. Castle and Museum.
2. Old Town from Princess Street.

EDINBURGH, *ĕd'ĕn-bŭr-rŭh* or *ĕd'ĕn-brŭh:* capital of Scotland, and chief town in the county of Mid-Lothian, occupies a picturesque situation on a cluster of eminences, at a distance of about a mile and a half from the Firth of Forth (q.v.), which is here about six miles in breadth. The outskirts extend almost to the shore, and a connection has thus been formed on the north with Leith, the ancient port; Newhaven, a fishing village; and Granton, a modern and rising port. The admirable position of E. has induced the comparison with Athens, from which, as well as its literary fame, it takes the title 'Modern Athens.' The Gaelic name of the city is 'Dunedin.'

The castle, which crowns the highest point in the city, was undoubtedly built first, a town gradually forming on the top and sides of the ridge, which slopes downward to the east. For some centuries the city was confined entirely to this ridge or hill, and was flanked on the n. by a lake or marsh called the Nor' Loch. The remaining means of defense was a wall built by the citizens about the middle of the 15th c., a few relics of which, of different eras, remain. E was therefore a fortified town, protected by the castle at its w. extremity. When David I. was induced by his piety and munificence to found the Abbey of Holyrood in the low ground e. of the city, he at the same time empowered the canons of this religious house to found a burgh in a westerly direction toward the city of E., and thus was built the Canongate, afterward united to the city. The beautiful abbey itself has been a ruin since the fall of its roof in 1768. In connection with the abbey sprang up the palace, which became a favorite abode of the Scottish sovereigns. Not, however, till about the era of the murder of James I. at Perth 1437, did E. become the recognized cap. of the kingdom. Neither Perth nor Scone, Stirling nor Dunfermline, being able to offer to royalty security against the designs of the nobles, E. with its castle was thenceforth selected as the only place of safety for the royal household, the parliament, the mint, and the various important government offices. By this means rising in importance, E. became densely peopled, and the houses were built to an unusual height, that the inhabitants might keep within the walls for the sake of protection. The town then consisted of the original main way called the High Street, reaching to the Canongate, and a parallel way, narrow and confined, on the s., called the Cowgate, connected with each other by upward of a hundred narrow cross alleys or closes, between dense clusters of houses. Most of these houses consisted of a succession of floors or flats, each being a separate dwelling, and of such floors there were seldom fewer than six, and sometimes ten or twelve, towering to an immense height, and rendered still more imposing from being built on an eminence.

The citizens remained content with these confined limits till about the middle of the 18th c. Between 1763 and '69, the North Bridge was erected, connecting the old city with the fields on the n., on which the *New Town* was beginning to be built. Shortly afterward, 1788, the line of this bridge

was extended s. by twenty-two arches (the South Bridge), only one of which is seen where the structure spans the Cowgate, and thus a level way was opened to the southern suburbs, which have since rivalled the new town in rapid growth. George the Fourth's Bridge was erected over the same valley a short distance westward, a considerable time afterward. The Nor' Loch was drained and partially bridged over by the Mound formed from the earth dug from the foundations of the new town, and its situation is occupied by fine public and private gardens which now lie in the centre of modern E., and separate Princes Street, the southmost and most picturesque street of the new town, from the old town. Two other bridges give access to E.—the Regent's Bridge, Waterloo Place, which arches the valley between Princes Street and the Calton Hill to the e.; and at the w. end, the fine Dean Bridge, 106 ft. high over the Water of Leith. The Waverley Bridge, parallel to the North Bridge, connects the Old Town and the New. The area of the city has steadily extended. The new town being built with much regularity in straight streets, and in squares and crescents with numerous gardens, contrasts with the crowded, though picturesque masses of the old town. The dilapidated and dangerous state of part of the old town, and the necessities of sanitary ameliorations in the overcrowded buildings, have occasioned great changes of recent years, and several new streets have been opened through the most crowded and ruinous localities.

Altogether built of durable sandstone from quarries in the neighborhood, the general aspect of the houses is that of great solidity. Among the most interesting features of the town are the Castle, in which are shown the ancient regalia of Scotland; the Parliament House, used by the Scottish parliament before the Union; St. Giles's Cathedral, lately restored, with a magnificent crown on the central tower; the Abbey and Palace of Holyrood (q.v.); the Bank of Scotland, recently rebuilt; the Scott Monument, designed by a native self-taught artist; Heriot's (q.v.) and Donaldson's (q.v.) Hospitals; the General Register House, where all heritable titles and state documents are recorded and preserved; the Post-office; the Royal Institution, where the Royal Soc , and the Soc. of Antiquaries of Scotland, meet; National Gallery; the Univ. and Museum of Science and Art; the Episcopal churches (St. John's and St Paul's); and the banks, clubs, insurance offices, and hotels of Princes Street and George Street. The unfinished National Monument on the Calton Hill is striking from its position. An Anglican cathedral and a new infirmary have been built. The country round E. is finely varied. From Arthur's Seat and Salisbury Crags, on the s.e., the eye wanders to the Braid Hills on the s., and the richly wooded Corstorphine Hill on the w., all within a mile or two of the town; while further off begin the Pentland Hills, four m. s.e.; and to the north the Firth of Forth, and the Fife coast and hills, form a magnificent background. The climate is bracing and healthful, though the situation is exposed. There

is less rain than on the w. coast, and high winds are prevalent.

E. is not an important manufacturing town, though it derives considerable commercial importance from its various banks and insurance offices, round which revolves no small portion of the monetary capital of Scotland The principal industries are brewing (two-thirds of all the ale or beer brewed in Scotland being made in or near E.), printing and publishing with the kindred arts (see BOOK-TRADE), distilling, ironfounding, tanning, and coachbuilding, manufacture of articles in India-rubber, of house furniture, and of jewellery, and the rearing of young trees in nurseries in and around the town, for which the climate is favorable.

E. is the place of residence of considerable numbers of the Scottish landed gentry, and its society is regarded as unusually polished from the predominance of the professional and literary elements in its composition. This arises partly from its being a university town, and partly from the presence of the supreme law courts of Scotland (see COLLEGE OF JUSTICE), all the important legal business being attracted thither on that account; the Edinburgh lawyers have charge of most of the landed estates throughout the n. part of the kingdom, so that there is an unusual number of advocates (barristers), writers to the signet, and solicitors (attorneys and conveyancers) and accountants. Its medical practitioners—surgeons and physicians—have high reputation. E. is much resorted to for the sake of education, for its university (q.v.) and medical schools, its high school. and its various other educational institutes. The Free Church and the United Presbyterian Church have each a well equipped Divinity Hall in E. The Merchant Company's schools (by utilizing certain surplus hospital funds) provide high-class instruction at moderate charges for about 6,000 male and female pupils. There are about 17 well-equipped board schools. The Heriot-Watt College gives scientific training at evening classes for moderate fees. Fettes College, a foundation school, is a handsome edifice.

E. is largely resorted to by visitors, and has an unusual number of hotels. There are three theatres. In the s. environs are fine open links or downs, where the game of Golf (q.v.) has been played from time immemorial; and on the adjoining park called the Meadows, an International Exhibition was held 1886. A suburban railway connects the city with its s. suburbs.

E. is a royal burgh, governed by a town-council composed of 41 members. The town-council elects from its own body a lord provost and six bailies, who constitute the civic magistracy. E. is represented, since 1885, by four members in parliament; till then it returned only two members.

Pop. (1821) 112,235; (1861) 167,851; (1871) 196,979; (1881) parl. 228,357, with suburbs, 236,002. Number of inhabited houses, 42,289: parliamentary and municipal constituency (1882-3), 28,931. Pop. (1901) 316,479.

EDINBURGH, ALFRED ERNEST ALFRED, Duke of: second son of Victoria, Queen of Eng.; b. Windsor Castle,

1844, Aug. 6. He entered the naval service 1858; declined the Greek throne 1862; became master of the Trinity House, duke of E., earl of Kent, and earl of Ulster, and took his seat in the house of lords 1866; was wounded by an alleged Fenian in New S. Wales 1868; married to the Grand Duchess Marie, daughter of Alexander II. of Russia, 1874; promoted vice-admiral 1882. On attaining his majority he was granted by parliament an income of $75,000 per annum and on his marriage was given an additional $50,000. In 1893 he succeeded Duke Ernst as reigning Duke of Saxe-Coburg and Gotha, and resigned his office as admiral of the fleet of the British navy. He died 1900, July 30.

EDINBURGH, University of: institution of learning, formerly under the govt. of the town-council and officials, to whom, with the ministers of Edinburgh it owed its origin. As early as 1561, the council was moving in the matter. For the purpose of a college they secured, partly by grant, mainly by purchase, the Kirk of Field, a Rom. Cath. collegiate church without the walls of the city, the place where Darnley had been murdered. In 1580, the royal sanction was granted; and 1582, the existing royal charter of the college was issued, giving the magistrates very large powers over the new institution. In 1583, the work of teaching began under a young but distinguished divine, Robert Rollock, first regent and sole teacher. The college was not modelled on the great continental universities, and from the beginning was rather a degree-granting college than a university in the mediæval sense. By 1590 there were four regents, Rollock being principal and prof. of theology. The system of teaching pursued was that each regent carried the men over the whole circle of the sciences taught in four successive sessions; the students who began their course under one regent received no part of their education from any of the others. This inconvenient system was not abolished till 1708, when the regents became professors, each of his special subject. Before this time separate chairs of Hebrew, Mathematics, and Public Law had been created; and three professors of Medicine, soon to become the most celebrated department of university work, were appointed 1685—the professors having at first no salary other than their fees. After the revolution of 1688, the Univ. of E., with its sister universities, was subjected to a parliamentary visitation. Under this supervision, a separate chair of Greek was established; and after 1708, the present arrangement of the Faculty of Arts came into existence. About this period, the Faculty of Law was created; and 1760, the Senatus Academicus contained 18 professors besides the principal. After a long struggle between the town-council which sought to retain its anomalous power over the professors, and the university which endeavored to secure some measure of independence in action, an act of parliament was passed 1858, by which the constitution of the univ. was materially changed for the better, and an executive commission appointed to carry out the changes. The government was taken out

of the hands of the lord provost and council of the city, and placed in the Senatus Academicus and a university court; and the patronage of the chairs—from 1582 in possession of the corporation—was transferred to seven curators, three of whom are nominated by the univ. court, and four by the town-council. A general council also was established, consisting (at first partly, now solely) of graduates. The members of council, with the professors and univ. court, vote for the member of parliament for the universities of Edinburgh and St. Andrews. Among the more distinguished of the Edinburgh professors have been M'Laurin, Gregory, the Monros, and Cullen; Black the chemist, Dugald Stewart, Prof. Wilson, Robison, E. Forbes, J. D. Forbes, Thomas Chalmers, and Sir William Hamilton. Carstairs and Robertson were principals. In the list of Edinburgh alumni are the names of Walter Scott and Thomas Carlyle; and Oliver Goldsmith, Charles Darwin, Niebuhr, Lord Palmerston, Earl Russell, and Lord Melbourne studied here.

Faculties, Degrees.—The university consists of the Faculties of Arts, Medicine, Theology, and Law. The Faculty of Arts comprises the chairs of Humanity, Greek, Mathematics, Logic and Metaphysics, Moral Philosophy, Natural Philosophy, Rhetoric and Belles Lettres, Universal History, Practical Astronomy, Agriculture, Music, Sanskrit, Engineering, Geology, Political Economy, Fine Arts, Education, and Celtic (instituted 1882). Attendance on the first seven of these is required of candidates for the degree of M.A. The Medical Faculty comprises the chairs of Institutes of Medicine, Materia Medica, Medical Jurisprudence, Chemistry, Surgery, Practice of Physic, Anatomy, Pathology, Midwifery, Clinical Medicine, Clinical Surgery, Botany, Natural History. The Faculty of Theology comprises the chairs of Divinity, Ecclesiastical History, Biblical Criticism and Antiquities, Hebrew. The Faculty of Law, comprises the chairs of Civil Law, Public Law, Law of Scotland, Conveyancing. The degrees granted by the univ. are Master of Arts, Bachelor of Medicine, Master of Surgery, Doctor of Medicine, Bachelor of Science, Doctor of Science, Bachelor of Divinity, Doctor of Divinity, Bachelor of Laws, Doctor of Laws.

Libraries, Museum, Societies.—The University Library originated in a bequest, 1580, by Clement Little. The bequest amounted to about 300 volumes. The library had the right of receiving every book entered in Stationers' Hall, but a composition of £577 per annum in lieu of the privilege was subsequently accepted. The Univ. Library contains about 150,000 printed vols. and 2,000 vols. of MSS. The univ. contains also subsidiary libraries, such as the Theological Library, the Humanity Class Library, etc. The Natural History Museum was established 1812, and received a govt. grant of £200 per annum. It was in 1854 transferred to the new Museum of Science and Art, where it forms a Natural History Dept., of which the prof. of natural history is the Regius keeper. The Anatomical Museum was founded by the town-council and the Senatus

Academicus 1826. The Botanical Museum is in the Botanic Garden, which is in connection with the university. The numerous societies for literary or scientific discussion have an important part in the training of the students. The Speculative Society was founded 1764, and the Royal Medical 1737. The Scots Law, the Dialectic, the Diagnostic, and the Philosophical constitute the Associated Societies of the university. About 100 bursaries or exhibitions are awarded to students; about 80 scholarships, some of them worth over £100 a year; and 10 fellowships, worth from £100 to £160 a year; total value over £15,000.

Students.—The number of matriculated students, 1904-5, was 3,024.

Building additions.—The most recent additions are McEwan Hall, finished 1893, the Hughes Bennett Laboratory, built 1901 and the John Ueker Institute of Public Health (1902). The Student's Union was enlarged in 1903, new class-rooms and laboratories have been built for physics and engineering.

EDINBURGHSHIRE, *ĕd'ĕn-bŭr-rŭh-shĕr*, or MID-LO'THIAN: the metropolitan county of Scotland, on the south side of the Firth of Forth; greatest length from e. to w. 36 m., breadth 18 m.; 367 sq. m. From the s. border, the Pentland Hills (mean height 1,000 ft., highest point 1,839 ft.) and the Moorfoot Hills (mean height 800 ft., highest point 2,136 ft.) run n.e. through the county. In the n. are fertile plains, varied by gentle slopes, ridges, and hills of trap. The coast, 13 m. long, is partly sandy, and is studded with towns, villages, and piers. The chief rivers are not more than 20 m. long, and are the Esk, Water of Leith, Almond, and Gala Water. Four great roads and five great railways traverse the county. Edinburghshire consists chiefly of carboniferous strata, with protrusions of trap. Some lower Silurian rocks occur in the s. east. Coal and iron are worked chiefly in the broad valley of the Esk. Here the bed of coal extends 15 by 8 m., and contains 33 seams ¾ of a foot to 6 ft. thick. The fine sandstone quarries of Craigleith contain large fossil trees, and the limestone of Burdiehouse is famed for fossil fishes. Cold and dry e. winds prevail in spring. Clay-soil predominates. The county is chiefly agricultural, with large farms. The harvest is a week earlier on the coast than at the height of 200 ft., and a fortnight earlier than at the height of 600 ft. Near the metropolis are extensive nurseries, vegetable and fruit gardens, and dairy pastures. In 1901, of the total acreage of 234,926 acres, 134,999 acres were in crop. Although not important as a manufacturing county, there are considerable manufactures of various goods in Edinburgh, Leith, and Musselburgh; and there are large paper mills along the course of the North Esk. Much paraffin oil is made from the rich bituminous shale found within the county. Edinburghshire returns one member to parliament. It contains 32 parishes. The chief towns are Edinburgh, metropolis of Scotland; Leith, its seaport; Dalkeith,

Musselburgh, and Portobello. In Edinburghshire have been found cairns, stone circles, Roman coins and utensils, and traces of Roman camps and burying places. Edinburghshire was included in the Roman province Valentia, and Cramond is supposed to have been a chief Roman port. It afterward formed part of the kingdom of Northumbria, 446-1020. The county contains many feudal and ecclesiastical remains, as Borthwick Castle, Craigmillar Castle, and Roslin Chapel. Pop. (1901) 488,796.

EDISON. *ĕd'ĭ-son*, THOMAS ALVA: electrician and inventor: b. Milan, O., 1847, Feb. 11. He began work as a newspaper boy on the Grand Trunk railroad, between Port Huron and Detroit, and within a few years contracted for the exclusive sale of books and papers on the entire road. His business grew rapidly, and for a time was supplemented by an essay in journalism, the *Grand Trunk Herald*, which he set in type, printed, and sold with his other papers. All the time not required for sleep and his business was applied to reading and study. He became interested especially in chemistry, and conducted experiments on the train till a car was set on fire by some of his phosphorus, when he abandoned chemistry and took up telegraphy. An operator, whose child he had rescued from death on the railroad, gave him his first instruction. As soon as he felt competent to receive and send a message, he sold his railroad contract and sought employment as a telegraph operator. He spent several years travelling through the United States and Canada; and while he soon became widely known as an expert telegrapher, he attained an equally broad reputation as a dreamy, unpractical youth. While in Indianapolis in 1864, he invented an automatic telegraph repeater, the first of his long series of improvements and inventions. He soon afterward went to Boston, where he invented a commercial stock indicator and sold it to New York capitalists for $40,000. With this capital he established an extensive laboratory at Newark, N. J., for the special manufacture of electrical, printing, automatic, and other apparatus. But in 1876 he was compelled to give up manufacturing on account of failing health, and he thereafter devoted his time to investigation and invention. He now removed his laboratory to Menlo Park, N. J., and later to West Orange, where he gave employment to hundreds of men and became known as one of the great inventors of his age. More than 300 patents have been issued on his inventions, and he has besides produced hundreds of minor contrivances and improvemets not covered by patents. Among his more important inventions may be named the phonograph, a telephone for long distance transmission, a system of duplex telegraphy (which he subsequently developed into quadruplex and sextuplex transmission), the carbon telephone transmitter, the microtasimeter, the ærophone, megaphone, the incandescent electric lamp, the kinetoscope, and a storage battery for street railway cars and automobiles. There

is not an electrical instrument, or an electrical process now in use, but bears the mark of some great change wrought by this most ingenious of Americans. He received the degree of PH. D. from Union College, and in 1878 was made a chevalier of the Legion of Honor by the French government, a commander of the Legion in 1889, and was the recipient of the insignia of a grand officer of the Crown of Italy bestowed the same year ;by King Humbert. In 1892 he received the Albert medal of the Society of Arts of Great Britain. He is a man of remarkable personality, and although beyond question a genius, he places no reliance on inspiration for new ideas. Very few of his inventions have been achieved without repeated failures, but failure merely spurs him on to renewed effort. As early as 1895 he commenced work on a new storage battery, and although he has labored at it more or less continuously since that time, and in 1897 devoted almost his whole time to it for an entire year, he has not yet brought it to perfection.

EDISTO, *ĕd'ĭs-tō:* river of S. Car., formed near Branchville by the North and the South Edisto; enters the Atlantic by two channels, between which is Edisto island, abt. 20 m. s.w. of Charleston. The stream is navigable for 100 m. upward.

EDIT, v. *ĕd'ĭt* [F. *éditer,* to publish—from L. *editārĕ,* the frequentative of *edĕrĕ,* to publish: L. *edĭtus,* published, uttered—from *e,* out; *dătus,* given]: to revise and prepare for publication; to publish. ED'ITING, imp.: N. act of an editor; the making or preparing for the press. ED'ITED, pp. ED'ITOR, n. *-tĕr* [F. *editeur*] one who superintends the publication of a book, magazine, or newspaper. ED'ITO'RIAL, a. *-tŏ'rī-ăl,* pertaining to an editor; written by an editor. ED'ITORSHIP, n. the office or employment of an editor. EDITION, n. *ĕ-dĭsh'ŭn* [F.—L.]: all the copies of a book printed at one time. EDITION DE LUXE: see DE LUXE.

EDITIO PRINCEPS, n. *ē-dĭ'shĭ-ō prĭn'sĕps* [L.] the first or earliest edition of any work; the first printed edition.

EDMONSTONE ISLAND, *ĕd'mon-stōn:* an area in the Delta of the Ganges toward the Bay of Bengal; at the mouth of the Hooghly, most westerly arm of the Ganges. It is the arena of a continuous conflict between the fluvial currents and the oceanic tides. From being merely a sand-bank, it came to be covered with shrubs, and even to yield a supply of fresh water. It was adopted under this new phase, as a marine station; but has since been abandoned.

EDMONTON, Canada, the capital of the Province of Alberta, situated upon the north bank of the North Saskatchewan river, opposite the northern terminus of the Calgary and Edmonton branch of the Canadian Pacific and on the main line of the Canadian Northern railway, and on the Grand Trunk Pacific railway now

under construction. Branches of the Canadian Northern railway now extend northwards and westwards some thirty miles, the north branch to terminate at the Athabasca river and the west branch to be carried on to the Pacific Coast. It is 340 miles west of Prince Albert and is the principal town of northern and central Alberta.

Industries and Business Interests.—Situated in a region underlaid with lignite coal of fair quality, with cheap fuel for its people and its industries, and the central point of one of the richest and most fertile agricultural districts in the west, the new capital of the new Province of Alberta has a great future. The city owns and operates its electric light and power system, its telephone and water services, and proposes to commence the construction of a municipal street railway. It has thirteen branches of thirteen chartered banks, ten churches and five public schools. Among its industries are saw, grist and planing mills, stock raising, and farming. It is the depot for the country within a radius of at least one hundred and fifty miles. The net assessment in 1906 was $17,046,798 as against $673,694 in 1892 and the total taxes levied in 1906 were $255,701.97 or a total rate of 10½ on the dollar, for all purposes. There is no tax upon the improvements upon lands, the assets being upon the land itself, upon income and upon the floor space occupied and used for business purposes.

History, Government and Population.—Commencing as a Hudson Bay fort in 1795, Edmonton was for three quarters of a century, as the District Headquarters of the Hudson Bay Company, a large market for furs and a central meeting and trading place for bands of Crees, Stonies and other Indian tribes. Until the middle of the nineteenth century it was the farthest unloading point to the north for the York boats from Hudson's Bay and its first permanent white settlers came in caravans from Fort Garry (Winnipeg), one thousand miles away, in hopes that the projected Canadian Pacific railway would adopt this route, though they were soon followed by returning gold seekers from the Cariboo District of British Columbia. It was, however, not until 1892 the Calgary and Edmonton railway was carried to Strathcona, while the city itself had no railway connection until 1902, when the Canadian Northern railway constructed its branch across the river valley. Until 1901 it was connected by ferry with Strathcona. On the 9th of January, 1892, the town was incorporated. In 1897-8 the place became the outfitting point for the Klondike rush and many thousands of people passed through on their way to the Yukon. On Nov. 7, 1904, incorporation was secured as a city, with a civic government consisting of a mayor, and eight aldermen, and an executive board of three commissioners.

The population, according to the census of March, 1901, was 2,600. In Nov. 1903, a civic census gave 5,500, while the return of the Dominion census of June, 1906, was 11,200.

EDMUND, Saint (Edmund Rich, d.d.), Archbishop of Canterbury: abt. 1195-1240, Nov. 16; b. Abingdon, England. He studied at the universities of Oxford and Paris, taught in the former several years, introduced the study of Aristotle there, and ultimately applied himself to theology, was ordained priest, and took his degree s.t.d. He was appointed treas. of Salisbury Cathedral 1222, was one of the preachers of the 6th crusade 1227, and resigned the office of treas. and was elected abp. of Canterbury 1233. A week after his consecration, he was instructed by an ecclesiastical council to threaten the king with excommunication if he did not dismiss his foreign councilors as required by a former council. The differences between the king and the abp. were widened when the king secured the appointment of a papal legate, in the hope that his authority might nullify that of the abp. The effort to stem the tide of papal exactions soon proved unavailing, and the abp. retired first to Pontigny and afterward to Soissy, where he died. His tomb became famous for miracles, and the pope canonized him 1246.

EDMUND IRONSIDE, *ĕd'mŭnd ī'ĕrn-sīd*, King of the Anglo-Saxons: 989-1016, Nov. 30; son of Ethelred II., and half-brother of Edward the Confessor. He is notable chiefly as the great opponent of Canute and the Danish party. On Ethelred's death (1016, Apr.), the Danes proclaimed Canute king of England; but the citizens of London declared for Edmund, who drew together his forces, and engaged Canute, first at Pen-Selwood in Somersetshire, then at Sceorstan (Sherston) in Wilts, and again at Ottenford (Otford) in Kent, in all of which battles he was victorious; but a severe defeat which he sustained at Assandum (Ashdon) in Essex, compelled him to a compromise with his adversaries. An arrangement was entered into by which England was divided between the two kings, Canute obtaining possession of Mercia and Northumbria, the rest falling to the share of Edmund. It was agreed also that on the death of either, the survivor was to succeed him. Soon afterward Edmund died, and Canute became king of all England. Edmund received the surname of *Ironside*, either from his great strength or from the color of his armor.

EDMUNDS, *ĕd'mŭndz*, George Franklin: b. Richmond, Vt., 1828, Feb. 1: statesman. He received a public school education, studied law, and was admitted to the bar, and began practicing when 21 years old. He removed to Burlington 1851, was a member of the state legislature 1854-60 and its speaker 3 years, was a member and speaker pro tem. of the state senate 1861-2, and took his seat in the U. S. senate as a republican, succeeding the late Solomon Foot 1866, Apr. 5. He was returned 1869, '75, '81, and '87, and succeeded Vice-Pres. Arthur as pres. (pro tem.) of the senate after the death of Pres. Garfield 1881. During his service he was chairman of the judiciary committee several years in succession; and in 1888-90 was chairman of the judiciary committee, and a member of

those on foreign relations and private land claims. He was chairman of the senate committee that acted in conjunction with one of the house in drafting the bill creating the electoral commission of 1877, and was a member of that body; was author of the act to suppress polygamy and disfranchise those who practised it 1882, declined the appointment of assoc. justice U. S. supreme court 1882, Mar. 11, elected pres. pro tem. of the senate 1883, Mar. 3, and was author of the act regulating the counting of pres. electoral votes 1886. He resigned 1891. In 1897 he became chairman of the monetary commission which had been appointed by the executive committee of the Indianapolis monetary conference. After his retirement from the senate he devoted himself to his profession, and achieved wide fame as a constitutional lawyer.

EDMUND'S (St.) HALL: in Oxford University, England, derives its name from St. Edmund, Abp. of Canterbury in the reign of Henry III. As early as 1269, it appears to have been purchased by the canons of Osney, and devoted to purposes of education. On the dissolution of religious houses under Henry VIII., it fell into the hands of two citizens of Oxford, who sold it to William Denyse, provost of Queen's College. The provost devised it to his college, and that society accordingly now nominates the principal of St. Edmund's Hall. There are ten exhibitions attached to the hall, value £30 per annum, appropriated to students designed for holy orders, and in the gift of the principal. There are usually about 150 names on the books.

EDOM, *ē'dom* (New Testament, Idumæ'a): a word signifying 'red'; name given to Esau on account of the *red* pottage supplied to him by his brother Jacob (see Gen. xxv. 29-34). Hence, the country which Esau afterward obtained was called the land of Edom, but previously Mount Seir. The ruddy hue of the mountain range, however, may have had something to do with the naming of the region. In the 7th c. after Christ, Edom was overrun by the Arabs, and has ever since shared the fortunes of Arabia.

EDRIOPHTHALMATA, n. plu. *ĕd'rĭ-ŏf-thăl'mă-tă* [Gr. *hedraiŏs*, settled, fixed; *ophthalmos*, the eye]: section of the class of crustaceans, consisting of those *malacostracous* crustaceans which have the eyes sessile—not mounted upon stalks. They differ from the other malacostraca in having the limbs respiratory. The section was adopted by Owen, and included an order *Læmodipoda*, with rudimentary abdomen; but all are now classed under the order *Tetradecapoda*, with two suborders: *Amphipoda*, in which the organs of respiration are connected with the thoracic limbs, and *Isopoda*, only with the abdominal or false legs. The Edriophthalmata are generally marine; many of the *Amphipoda*, however, are inhabitants of fresh water; some of the *Isopoda*—as the armadillo-louse and wood

louse—are terrestrial, but are inhabitants of damp places. Many both of the marine and fresh-water species spend their lives rather among the weeds and decaying matters of the shore than in the water, to consume these being apparently their office in the system of nature; some have organs adapted for leaping and for burrowing in the sand, as the common Sandhopper (*Talitrus locusta*), one of the *Amphipoda*, of which countless myriads are to be seen on sandy shores; some burrow in more solid substances, as the *Limnoria terebrans*, one of the marine *Isopoda*, which sometimes effects the destruction of piers, dock-gates, etc., perforating them in every direction. Many of the Edriophthalmata are parasitic, some of them on whales, some even on prawns and other crustaceans. Some of the parasitic Edriophthalmata are destitute both of eyes and of antennæ.

EDRISI, *ĕd-rē′zē* or *-sē*, Abu Abdallah Mohammad bnu Abdallah bnu Edris, Al-Hamudi, Sherif: called also Al-Edrisi, Al-Sikili (Sicilian), or Al-Rodjari (Roger's): one of the most eminent Arabic geographers, a descendant of the royal family of the Edrisites—who traced their origin to Mohammed himself: b. at Ceuta or Sibta (Civitas), 1099; year of death unknown. He studied at Cordova, and early distinguished himself by the extraordinary range and versatility of his talents. He excelled in nearly all then known branches of science and art; but it was geography which at a very early age seems more than any other science to have attracted him. He invited travellers from all parts of the world to assist him by sending their itineraries, their measurements of longitudes and latitudes, their observations and adventures—in short, all they had seen or heard on their journeys. The collection of this material occupied 15 years, at the end of which it was handed over to Edrisi. Thus guided, he drew up a map, on a globe of pure silver, weighing 450 Roman pounds (50,400 drachmas), in which the whole of the then known world was represented. He, like Ptolemy, divided it into seven climates, beginning at the equinoctial line, and continuing northward to the limits of extreme cold and intersected each of these with eleven 'regions,' represented by perpendicular lines, without any regard to the political or physical features of the respective countries. In explanation of this map, he wrote a book (1153), *Nuzhat al-Moshtak*, etc., in which a full account is given of the towns, mountains, rivers, etc.

EDUCATE, v. *ĕd′ū-kāt* [L. *edŭcātus*, brought up, reared —from *e*, out of; *dūcō*, I lead: It. *educare*]: to bring up; to instruct; to inform and expand the mind; Ed′ucating, imp. Ed′ucated, pp.: Adj. instructed; trained; furnished with knowledge. Ed′ucator, n. *-kā-tėr*, an instructor; a teacher. Ed′uca′tion, n. *-shŭn*, instruction; formation of manners; the cultivation of the moral, intellectual, and physical powers. Ed′uca′tional, a. *-ăl*, pertaining to education. Syn. of 'educate': to train; teach; inform; breed; mature; rear; discipline; indoctrinate; enlighten.

EDUCATION, American School System. *Distinguishing Features.*—The educational system of the United States is often characterized as 'unique.' Perhaps it may be distinguished from the systems of other countries in the following particulars:

1. It was not initiated by the government or by any central power. Schools were started wherever there was a settlement. Farmers united in the support of a school at the cross-roads. As cities grew, the grading system was commenced. Accordingly, the school system has always been exceedingly flexible and adaptable to local conditions.

2. The system has not been managed by central authority. It has been and is administered through primary assemblages of citizens, wherever practicable, and by officers chosen at popular elections, when meetings of all interested citizens became impracticable. In the larger cities the schools are managed by boards of education, elected by the people or appointed by officers so elected. The management of the schools has never been given over to a minister of education, but invariably kept in the hands of the people.

3. Originally, schooling was held to be a private or parental matter. The state was to give moral encouragement only, at first, and later some financial aid, to the schools. But as it came to be seen that the safety of the state, with universal suffrage, depended upon the schools, the law-making power began to exert control in the matter to the extent of assuring a suitable school to every home, and by exercising the taxing power, directly and through delegating it to local corporations, so as to subject all property to the educational expenses and making the schools free.

4. The use of the taxing power by the state logically made it necessary for the state to oversee the expenditures of money, and this enlarged the centralized influence over the educational system. As schools multiplied and grew in size this enlarged state influence became necessary and welcome. It tended to consolidate the system and make the work more uniform. The result is system and uniformity, happily balanced with local self-management and adaptability to the immediate conditions.

5. Out of this has grown a system of local expert supervision through superintendents of schools—a system which is indigenous and exclusive to America.

6. The public educational scheme has extended beyond the free primary school in reach of every home, and now includes free secondary schools or high schools in every considerable town, and a free college or university in nearly every State.

7. The schools of different grades, from the primary to the university, work together with considerable exactness. The course is practically continuous and pupils are fitted by each school for the school above and en-

couraged to go to the top of the educational system. There are no class distinctions.

8. The schools, in law and in popular thought, have no flavor of charity. They are the inalienable right of all, an integral part of the governmental plan. They are not a boon of the government to the people, but they are the people's own, for their own and the nation's upbuilding.

9. The educational scheme leaves every community free to elaborate its school plans according to its own intelligence and means. It also encourages all manner of private educational undertakings. Every effort for enlightenment or culture, whether in an organized school or not, is sustained and finds a welcome place in the educational system of the country.

10. The public, or 'common,' school system is free from all partisanship or sectarianism. The state encourages parties and sects, but it will not enter into financial relations with them nor divide its responsibilities with them.

11. Girls have equal educational rights with boys in America. The sexes are almost invariably trained together in the primary and secondary schools and in all of the higher institutions supported by the state.

EDUCATION IN THE SOUTHERN STATES. See SOUTHERN STATES, EDUCATION IN.

EDUCATION IN THE UNITED STATES. The history of education in the U. S. began with the history of the country. The English colonists very early established colleges, and grammar schools to prepare students for college; these schools were, of course, only for a few. It was generally understood to be the duty of the parents, and not the public to provide elementary education for their children; but the laws of Massachusetts in 1642 required that the selectmen of each town should see that the education of children was not neglected, and in 1647 towns of a certain size were required to appoint a teacher for the children, and where necessary to build a school. The expenses were not necessarily paid from the public funds, though it was provided that they might be so paid. In other colonies of New England similar beginnings of public school education were made. It was the Dutch, however, who carried out most fully the principles of free education; they established free elementary schools, and the first school tax was levied and collected in Manhattan, 1633. These free schools were abolished, however, when the English gained control of the Dutch colonies. With the revolution and the growth of democratic feeling there came a change in the attitude of the people toward education. Yet the establishment of public schools did not begin at once; the belief that parents were responsible still persisted, and the schools established, though they increased in number and importance, were regarded more as partnerships between parents. Those who could pay were required to do so, though many communities and states provided free education for poor children.

Many schools were established and authorized by the state during this time, but they were of various grades, with no uniformity in organization or administration. In the years of 1830 to 1845 there was a general awakening to the fact that an organized system of public schools should make an education accessible to every child. During these years every state adopted some measure of control of public education, and since that time every new state as formed has followed the example of its older neighbors. In this way the public schools of America have become the dominant factor in elementary and secondary education, and have largely influenced the policies of the institutions of higher learning, although these remain mostly under private control.

In spite of the complicated development of the school system of the U. S. and the complete autonomy of the states, there is as great unity and similarity in courses of instruction and methods of administration in American schools as in those of any other country. In every state the entire course of instruction is so organized as to form a symmetrical whole. The transition from elementary to the high schools, from the high schools to college, and from there to the professional school is made without a break. The course of instruction is practically the same in every locality, and consists of eight years of elementary work, four years of secondary work, four years of college work, and four years in a professional school. In many cases, however, the professional schools may be entered directly from the high school, or with only a partial college training; or a four years' course at a school of technology may take the place of a college course.

In one important particular the public schools of America differ from those of Europe, a difference resulting from the democratic institutions of the country. In foreign educational systems, two distinct classes of schools are maintained under government control,—the first usually called primary education, though designed for children from 5 to 15 years of age, is intended for the children of the working class to train them for their trades; the second, called secondary education, for pupils of 5 to 18 years of age, is intended to train for the universities, embracing a study of the classics. In the U. S., however, no such distinction is made; all children in the public schools are given the same instruction, and no discrimination is made except such as is based on mental differences. The course of instruction is broader than either of the two foreign courses, including both the classic and the more practical elements. The ideal of American education is to develop the child's powers of mind on broad general lines, and in later years to add the necessary special training for trade or profession.

Another distinguishing feature of American educational policy, is the fact that co-education of the sexes prevails through all grades. In the elementary schools it is practically the universal custom to educate boys and

girls together, and in the high schools as well, except in some of the larger cities. In the colleges, too, co-education, though not so universal, is a well established policy, especially in the West (see Co-Education), and in graduate schools women are usually admitted on equal terms. At the same time the number of women employed as teachers in the public schools for both boys and girls largely exceeds the number of men.

The liberal support of education has been an important factor in its development in the U. S. Constantly increasing sums have been appropriated by the national government, the states, and the local governments for the furtherance of educational interests and the equipment and improvement of schools. The founding of the State Universities of the West, and the establishment of high schools in all the larger towns illustrate this tendency. Co-ordinate with the public support has been the growth in the number and importance of private gifts for the establishing and supporting colleges, universities, and other educational institutions such as libraries, museums, the Carnegie Institute, etc.

National Government and Education.—While the national government has never exercised any direct control over public education it has in various ways aided and influenced it. In the first place it has made large grants of lands to the various states for the founding of institutions for higher learning. This was first done at the time of the organization of the Northwest Territory, when two townships were set apart for a 'literary institution.' This precedent became established, and after 1800 every state admitted to the Union, except Maine, Texas and West Virginia received two or more townships for the founding of a university. Equally important was the Land Grant Act of 1862 which gave each state 30,000 acres of land for each senator and representative in Congress to which the state was entitled in 1860, for the purpose of founding colleges in which instruction should be given in agriculture and the mechanic arts 'without excluding other scientific and classical studies.' In addition to these gifts, the national government has established a Bureau of Education, which although it exercises no official control over educational institutions, exerts a wide-spread influence. Its general purpose as defined by the law is to collect such statistics and facts as shall show the condition and progress of education in the several states and territories and to diffuse such information respecting the organization and management of schools and school systems, and methods of teaching, as shall aid the people of the United States in the establishment and maintenance of efficient school systems and otherwise promote the cause of education throughout the country.' In addition to giving statistics of education and formulating conclusions from these statistics, the reports of the bureau contain special investigations and discussions on various timely subjects of interest to educators.

State Supervision.—The supervision of schools is a power lodged in the states, and each state has its own school organization and laws. In many cases state school funds have been created, or large sums are raised by a general levy each year which are distributed so as to give aid to the districts most needing it. All state constitutions have some provisions for popular education, and all have much legislation in reference to schools. In all there is some sort of a state school organization established by law. In practically all there is an officer known as state superintendent of public instruction, or state school commissioner. In some there is a State Board of Education. In New York state the control of all schools has been centralized in the Board of Regents of the University of the State of New York (q.v.). In New York state the regents exercise a more complete power over the schools than do most state boards; but in general state control extends to the supervision of buildings, the general arrangement of the curriculum, and the requirements for teachers. Moreover, excellent normal schools, and in the South and West, state universities are maintained as a part of the state school system. The right to compel children to attend school has been questioned by some, but most states now have compulsory education laws; in practically all, children are required to attend school from the age of 7 or 8 to that of 14 or 16. There is no doubt that the application of state authority to all schools supported by public money makes them better and more alike; whims of local settlements disappear; schoolhouses are better; more is done for the preparation of teachers, and more uniform exactions are put upon candidates for the teaching service; the courses of study are more quickly and symmetrically improved; there is criticism and stimulus from a common centre for all of the educational work of the State.

Local School Systems.—The 'school district,' is the oldest and the most primary form of school organization, and the smallest civil division of our political system. It resulted from the disposition of neighboring families to associate for the maintenance of a school. Later it was recognized by law.

The control is exercised by school meetings composed of resident legal voters, often including women; executive officers known as trustees or directors are elected to supervise details and appoint teachers. This form of organization is in many ways well suited to a country community and is found in nearly all states. It is being very generally superseded, however, by the township system, by which the town is made the unit of school, organization, and the schools are supervised by officers or boards chosen by the town meeting. These officers have charge of all the elementary schools in the township and the town high school, if there is one. Of course the township system is much less formally democratic and much more centralized than the district system. It

has doubtless produced better schools and schools of more uniform excellence. One of its most beneficial influences is the multiplication of township high schools.

In the southern states a similar centralization of local schools has taken place through the establishing of county systems, resulting from the general systems of county government prevailing in the South. The county boards or officers,—the method of election differing in the various states,—exercise the same functions as the township school boards. In cities where it is difficult for people to meet to fix the policies and manage the business of the schools, or to choose officers to manage the schools, the state legislatures make special laws for city schools. In some states these laws are uniform for all cities of a certain population, but more often each city has gone to the legislature and procured the enactment of such statutes as seemed suited to the immediate circumstances, so that there is no uniform or general system of public school administration in the American cities. But in nearly every case there is a board of education charged with the management of the schools; these boards differ in constitution and in legal functions in different cities. Under present laws the powers of these city boards are very large, almost without limit as to the management of the schools. Much dissatisfaction has often been expressed with the management of city schools, largely because the question of politics has entered into the policies and appointments of the school boards, and the control has been left sometimes in the hands of men absolutely dishonest, but more frequently with those incompetent to deal with the problems presented to them because unacquainted with educational methods and school requirements. The demands of the friends of popular education in our great cities are for a plan of organization separating legislative and executive functions, putting the interests of teachers upon the merit basis and leaving them free to apply pedagogical principles to the instruction, giving large authority to officers and teachers, but locating responsibility and ousting the incompetent or corrupt. The teachers for the public schools are certified under state laws, and are trained in normal schools maintained at state expense, in training schools and classes, and in pedagogical departments of universities. The number of students enrolled in these institutions in 1903 was 88,003. In the cities and villages of nearly every state in the Union professional training is required of all teachers. In the rural districts ability to pass state licensing examinations is sufficient qualification. See TRAINING OF TEACHERS.

Private Institutions.—Besides public schools there is a large number of other schools which comprise an important part of the educational system of the country and are of course subject to its laws. Most important of these, are the colleges and universities, most of which are under private ownership and control. Many 'academies'

or secondary schools also exist, though in general their importance is decreasing as that of the public high schools increases. In recent years innumerable schools have arisen out of private enterprise. Every conceivable interest, professional, technical, industrial and commercial, has produced a school to promote its own ends.

All such schools operate independently of the states in which they exist. The states do not interfere with them, as they ask no public support. Some of them hold charters granted by the legislature, and more secure recognized standing by organizing under general corporation laws enacted to cover all such enterprises. In some cases the states distribute public moneys to some of these institutions by way of encouragement, and perhaps impose certain conditions upon which they shall be eligible to share in such distributions. But ordinarily a state does no more than protect its own good name against occasional impostors. New York, for example, has prohibited the use of the name 'college' or 'university' except when the requirements of the State Board of Regents are met.

Elementary Education.—The elementary schools under private control, with the exception of the Roman Catholic parochial schools, are few and of little importance. The early education of children is almost universally in the hands of the public school. These elementary schools may be divided into two classes,—the rural schools and the graded town and city schools. The former in sparsely settled districts continue their old practice of holding a winter session of 60 to 80 days only; the usual school year is about 200 days or 5 days per week for 40 weeks.

The graded schools are naturally much superior to the rural schools. In the first place they can and do employ professionally trained teachers, from which the rural schools are precluded by the shortness of their terms. The graded schools further have a regular course of study, and a uniformity of text-books, and a proper classification of pupils. In the small rural schools 20 to 50 pupils at various degrees of advancement are brought together under one teacher, and the individual in such cases can receive but little attention.

In a properly graded school each teacher has two classes and hears one recite while the other is studying. Each class numbers 20 or 30 pupils who are approximately at the same stage of advancement, so that all learn by the class recitation. The subjects of elementary instruction include reading and spelling, writing, arithmetic, geography and history; more recent additions to the curriculum are physiology, including instruction on the evils of alcohol and narcotics, civics, nature study, drawing, and manual training. The last three have not found their place in all schools, but chiefly in the more highly developed town and city schools. Nature study is commended as developing the child's power of observation and investigation when properly taught; and manual

training is just obtaining recognition as an important factor in general education. See MANUAL TRAINING.

It is presupposed that the chief work of the pupil in school is the mastery of text-books containing systematic treatises giving the elements of branches of learning taught in the schools. The evil of memorizing words without understanding their meaning or verifying the statements made in the text-book is incident to this method and is perhaps the most widely prevalent defect in teaching to be found in the schools of the United States. The oral method of Germany escapes this evil almost entirely, but encounters another. The pupil taught by the oral method exclusively is apt to lack power to master the printed page and get out of it the full meaning; he needs the teacher's aid to explain the technical phrases and careful definitions. The American method of text-book instruction throws the child upon the printed page and holds him responsible for its mastery. In the hands of a trained teacher the good of the method is obtained and the evil avoided. The pupil is taught to assume a critical attitude toward the statements of the book and to test and verify them, or else disprove them by appeal to other authorities, or to actual experiments.

One of the reports of the Moseley Commission summarizes the results of American elementary education as follows: 'The average attainment is no higher in them (the elementary schools) than in England. The progress is slow, the methods are discursive. But the relations between teacher and pupil are much closer, the method of discussion is employed with great benefit to mental development, the pupil's mistake is followed up psychologically, and by these means a more inquiring and critical attitude of mind is produced, with a greater appreciation of the value of education. The anxiety to hold the attention and the constant divergence into related but irrelevant topics possibly cultivate a large sense of personal importance and an inaccurate and superficial habit of thought. But a recognition of the unimportance at this stage of the acquisition of specific knowledge, and the importance of a spirit of inquiry, individuality, and initiative, is general in the United States.'

Secondary Education.—The history of American secondary education presents three stages of development. First, the colonial period, with its Latin grammar schools; secondly, the period extending from the Revolutionary War to the middle of the 19th c., with the academy, and, thirdly, the period down to the present, chiefly characterized by the growth of public high schools.

Early in the history of Virginia funds were raised and lands set apart for the endowment of a Latin grammar school, but the school was not opened on account of the Indian massacre of 1622. Boston in 1635 set up a Latin school which has had a continuous existence; other New England towns soon followed the example of Boston; and similar secondary schools were established in New

York, Pennsylvania, Maryland, and other colonies. These schools were designed primarily to prepare for college and taught little else than Latin, Greek, and religious doctrines. After the Revolution the old Latin schools were weakened by the democratic tendencies of the time, and a new type of school appeared commonly known as the academy.

The old academies were generally endowed institutions, organized under the control of self-perpetuating boards of trustees or of religious bodies, established to serve the need of a wide constituency and not merely of a single community, and often located in small country places. Many of them made provision for boarders as well as for day pupils. They were not intended in any exclusive sense for the training of future members of the learned professions, although most of them developed into preparatory schools. For the most part, the agency of the State in establishing secondary schools was limited to subsidizing privately managed academies. The academies laid new stress on the study of the English language, together with grammar, rhetoric, and public speaking. They taught mathematics, often including surveying and navigation; began the study of natural science, especially of natural philosophy (physics), of which astronomy constituted an important division; gave courses in geography, ancient history, English and above all American history, French often and German seldom. Latin and Greek were the substantial core of the instruction offered. In the earlier days, the course of study was not well defined. When definite courses of study were laid out, they varied in length from three to four or five years. In the first half of the 19th c. there grew up a strong demand for schools under the exclusive control of the State. The first public secondary school was established in Boston in 1821, and a few years later in other large cities of the Eastern and Middle States.

The academies declined as the high schools advanced; many were given over to the communities where they were located and became public high schools, and those that survived emphasized more and more their function of preparing for college. The high school movement had from the first a strong hold in the Western States, where the smaller towns and villages possess high schools more frequently than communities of similar size in the East and South. The usual departments of secondary instruction include Latin, Greek, English, modern languages, mathematics, physics (with astronomy and chemistry), natural history, history (including civil government) and geography (including meteorology and geology). With this multiplicity of subjects, the elective principle is, of course, recognized, and the courses adjusted as far as possible to the needs and capabilities of the individual student. In the best schools the classical course is still regarded as the standard, from which the other courses are variants. In the large cities two classes of special

high schools have been established, the manual training schools, and the commercial. In the former the manual training is of a general character, not a preparation for any particular trade, and is combined with other courses of the regular high school; the commercial high schools include book-keeping, commercial arithmetic, and similar subjects in their more general courses, and their work is usually conducted on broader lines than that of the private commercial schools. The method of instruction, as in the lower schools, is based on the text-books and the class recitation; the teaching of English includes discussion of certain classics of the English language, and frequent original composition. In the science teaching, laboratory work has a place, many secondary schools having excellent laboratory equipment; much stress is laid on the accurate observation and recording of experiments The question of the relation of the high schools to the colleges has received much attention from educators; in general the tendency is to do away with college entrance examinations, and establish some sort of accreditive system admitting from the secondary schools to the colleges. Through the influence of the National Educational Association (q.v.), the requirements for college have been brought to a unified standard throughout the country, thus tending also to unify the secondary courses.

Higher Education.—As has been stated the beginnings of higher education in the United States were co-incident with the settlement of the colonies. The first provision for the support of a college was made by Massachusetts in 1630, and Harvard was founded a few years later. By the end of the 18th c. there were 13 colleges in the United States; since which time they have multiplied so rapidly that in 1907 the institutions doing college work number 460. See COLLEGES IN THE UNITED STATES. Co-incident with the increase in the number of colleges has been the broadening of the college course and the growth of technological and professional schools. Owing to the great industrial progress of the United States the former advanced and improved rapidly in the 19th c., and have become of special interest to educators in other parts of the world on account of their advanced methods and important influence upon industrial life. (See TECHNOLOGY, SCHOOLS OF.) Greater care has been taken to ensure a high standard for professional degrees, though each State makes its own laws in the matter, and hence the standards vary. As a rule professional schools do not require a college education for entrance, though in some cases this is done. The union of the college with professional schools and schools of technology in a university is becoming the typical form of organization for higher education in the United States. The older colleges have usually added first one department and then another to their original institution; it is only in the institutions of comparatively recent origin that a university organization was attempted from the first. These universities are markedly different

1. College Hall, Vanderbilt University.
2. University of Tennessee, looking northward.

from the universities of other countries, but they respond to the educational needs of the American people, and are playing an increasingly important part in American life. Ambition for the university title has had so marked a development that within a quarter of a century the number has risen to 132. Moreover, the interest in higher learning has so increased that in 1907 no less than 39 of these report over 1,000 students each, seven report 3,000 and more, namely, Cornell, New York, Syracuse, the Northwestern, California, Pennsylvania, and Yale, while Columbia, Michigan, Illinois, and Minnesota claim over 4,000, and Harvard, Chicago, and Valparaiso are credited with an attendance of 5,000 each. It is well known that the body of students, save in the foremost of the institutions, are undergraduates, giving themselves to college studies only, and that we have, as yet, no institution limiting itself to university work. See STATE UNIVERSITIES; UNIVERSITIES.

Other Educational Agencies.—In addition to the regular school organizations there are other institutions which supplement their work, reaching those for whom the schools cannot provide, increasing the opportunities for education among those whose school days are short, or co-operating with the regular work of the school. Prominent among such supplemental agencies in the United States is the public library. (See LIBRARIES.) Other agencies which may be mentioned and which will be treated under their proper titles are summer schools, university extension courses, correspondence schools, evening schools, traveling libraries and educational classes in connection with institutional churches and other charitable organizations. Then there are also the schools for special classes of defective children, for the deaf and dumb, for the blind, and for the feeble-minded. Some of these are conducted as charitable enterprises,—but more by the State, as the theory prevails that it is as much the duty of the State to care for defective children as for any others, and that such care is in no way a charity.

Porto Rico and the Philippines.—With the expansion of its territory the United States has met with new problems in education and has dealt with them in such a way as to successfully establish school systems in Porto Rico and the Philippines. The schools in Porto Rico include rural schools and town graded schools for elementary education, high schools and industrial schools in a few of the larger cities, rural agricultural schools, and night schools. A law has also been passed providing for the establishment of the University of Porto Rico; a normal school was organized as a part of this university, and was its first department. The need for professional training has not yet been met. The work of the elementary grades includes language work, reading, writing, spelling, and memorizing in both Spanish and English, arithmetic, nature study, history and biography and art. In the town schools the courses are systematically graded; for the

rural schools a special course with a more simple arrangement has been prepared by the education department,—and this more by way of suggestion than actual requirement. The high school courses include Latin, Greek, and the modern languages, with special work in English and Spanish, mathematics, history, science, drawing and music; the industrial schools omit the classics and modern languages, retaining the English and Spanish language work, and add industrial courses, such as Lloyd, woodwork, and for girls, cooking and sewing, and more thorough courses in drawing.

In the agricultural schools very young pupils are admitted as well as older ones, and the work proportioned to their needs; the purpose is to awaken an intelligent interest in the soil and the workings of nature, as well as to teach the use of improved tools and methods. The teachers are graded and licensed, and provision is made for training the teachers of the future in the normal school, the standard of which is excellent.

In the Philippines education under the American government commenced with primary instruction, and it continues to be almost entirely primary,—the aim being to place the elements of an English education within reach of every child. This course of primary instruction covers but three years, and includes courses in English, number work and arithmetic, elementary geography, singing, drawing and manual training. Between this primary course and the provincial high schools there is an intermediate course of three years, which is given at all high schools and in many of the larger municipal schools. The main reason for making the primary course short is the need for a course of study, which though simple, is fairly complete, and can be understood by Filipino teachers and put within the reach of all in a comparatively short time. American teachers have been placed in charge of school districts, comprising several schools with native teachers; the Americans assist in organizing the schools, and then visit them regularly and assist the Filipino teachers. In addition the teachers have been gathered in each province or school division for four to eight weeks in a normal institute. The progress which the Filipino teachers have made with their brief training has been most remarkable and most gratifying. Secondary instruction is really hardly more than beginning in the Philippines, many of the provincial high schools giving most attention to the intermediate works for the first years. The courses as prescribed in English literature, history and science would compare favorably with American high schools, though less preparation is required. Little Latin and no Greek is taught, and only the simpler mathematical studies; the English is depended upon to take the place of the classics. In addition there are at Manila three special schools, the Normal School, the School of Arts and Trades, and the Nautical School. Very little teaching has yet been done among the pagan tribes; several experiments have been

tried in introducing a simple course of study, including industrial work, but for some time this feature of Filipino education must remain in its tentative stage. Taking the educational work in the Philippines as a whole, however, a teacher of experience says: 'The outlook is favorable for a healthy growth and development.'

EDUCATION, MORAL TRAINING IN. See MORAL TRAINING IN EDUCATION.

EDUCATION, NATIONAL SYSTEMS OF. All of the nations laying claim to any part in the civilization of the world sustain some kind of a system of common instruction. This is not only true now but it has been true as far back as history runs. Even the pagan nations which have consistently defied civilization have held and exemplified certain ethical principles, various classes of knowledge, and many interesting and expert accomplishments which they have taught to their young. Some of the nations which we would not quickly classify as civilized maintain not only schools, but schools of differing grades and in some cases they are related together in systems of very considerable organized efficiency. The civilized nations have all developed, either under public or private control, institutions comprising school systems, often extending from the kindergarten to the university, and in many cases they have added elaborately equipped and purposeful educational systems going far beyond the functions of schools. The monarchial governments have educated a favored class more or less exclusively, giving but the rudiments of knowledge to the masses. The democratic governments have opened schools and other educative instrumentalities more and more to all the people. We are to present here, in a necessarily general way, the salient features of these different national systems of education, and will begin with those of the simplest form and the least international pretensions, and later take up those which are more ambitious and more elaborately and expensively organized. The order of presentation, however, must not be taken to indicate any close or deliberate arrangement of these different systems in the order of their excellence. It is not practicable to present all, or to present any very completely, and the order of arrangement is not to be taken as significant of merit beyond the general fact that we begin with the simpler and proceed to the more complex forms of organization and administration.

China.—China has undoubtedly maintained a system of instruction for the children of the higher classes and propagated certain very definite philosophical theories for thousands of years. The Imperial government provides a system of examinations, but leaves the training to parents and guardians. Schools are mainly supported by private subscriptions. The rich employ tutors for their sons. The girls count for little. The conditions of the masses are hard. Some classes maintain clan schools for their own children. Charity schools, sup-

ported by philanthrophy, exist here and there. The best schools are conducted by the missionaries. The greater number of children are mainly without education. In recent years the Imperial government has established a university, a normal school, and a school of languages, and some of the provincial governments have opened colleges and military and naval academies. One province is attempting a system of graded schools. The whole school system is inchoate. Control by parents and filial regard for parents are national fetiches, regardless of the fitness of the parent for the exercise of control or for worship, and no duty of the state to the ignorant child of the masses is anywhere asserted.

Spain.—Spain has a system of primary schools. It is supported by local funds. The municipalities are by law charged with maintaining schools but the obligatory provisions do not seem to be much enforced. Worse than all, there is apparently but little educational sentiment. It seems strange that a people with such a long and, in some regards, an heroic history—almost conquering the world at one time—and a people with so much artistic feeling and so many polite accomplishments should have so little educational initiative. But it is so little that in the absence of government support and compulsion the schools are disjointed and often superficial. So far as the scheme of the educational laws goes it seems well enough, but it fails in the vital points of application and compulsion. Primary instruction is divided into three classes, viz.: first, instruction for infants between three and six years, elementary instruction between six and nine, and superior instruction for children between nine and twelve. The work covers the ordinary primary subjects familiar in America. Some advanced schools are being developed and in many of the provinces there are normal schools for training teachers. The teachers' salaries seem to be determined somewhat by the size of the towns and vary from $150 to $900 per year. In addition to the absence of educational sentiment and initiative there is the no less notable absence of higher institutions to give zest and guidance to elementary schools. A census taken in 1860 shows that 20 per cent. of the population could read and write, that 4.6 per cent. could read only and that 73.3 per cent. could neither read nor write; a census taken in 1889 shows that 28.5 per cent. could read and write, that 3.4 per cent, could read only, and that 68.1 per cent. could neither read nor write; the last census, taken in 1900, shows that out of a total population of 18,607,674 there were 11,869,486, or 63 per cent., who could neither read nor write. Here is an ancient empire with history and traditions, conspicuous position and great resources, with extraordinary culture of a kind, and with varied refined accomplishments, and yet the masses are in sodden ignorance. It is not because of the lack of laws nor because there are no schools. It is because the laws are meaningless, because of false views

of life, because Spanish history, with all of its valor, has not made for true civilization.

Italy.—In Italy at least one lower grade school is required to be maintained in every commune. Communes of more than 4,000 inhabitants must establish a high school. Classical instruction is provided in about a thousand institutions and technical instruction in about 400 advanced technical schools. There are many universities, of more or less importance. The leading libraries and art galleries are extremely rich in their possessions. These institutions exert a very considerable influence upon the intellectual life of the kingdom, as they certainly do upon the culture of the world.

Attendance upon the elementary schools seems to be enforced, but it does not extend beyond the ninth year. The elementary schools are supported by municipalities. The character of the schools is looked after by government school inspectors. Religious instruction is no longer obligatory. Many schools are supported by the Church, in which, of course, religion is taught. There are also many private schools established to serve one or another special end. In all of these the government requirements, which are not onerous, have to be observed. Education is practically free up to the university. Illiteracy is growing less. It is now about 35 per cent. and has decreased by about half in the present generation. There are many schools for special purposes, such as art, agriculture, mining, business methods, etc. There are 150 training schools for teachers, with 20,000 attendants. The government does much for musical training. The growth of religious toleration in the kingdom and the added intermingling with other peoples are clearly aiding the progress of Italian education.

Japan.—Japan presents probably the most conspicuous illustration in the world of the quick formation and the rapid evolution of a national system of education. In 40 years the Japanese people have passed from a chaotic educational situation to one very definitely, very completely, and very systematically and philosophically organized and administered. Where so much has been done in so short a time there is undue tendency to exaggerate statement and commendation, but there can be no doubt about the spirit and purpose and plan and determination which have accomplished so much, being entitled to the most enthusiastic admiration and approval, even though we distinguish the fact that the things accomplished could not, in so short a time and under such conditions, come abreast of the educational progress of some of the older and more democratic nations.

The elementary school system is practically universal, there being 27,000 schools in 1902-3. The attendance of children between six and fourteen is compulsory, and the people in Japan seem to be in the habit of doing as the law directs. In 1902-3 the attendance of both boys and girls was more than 90 per cent. of the school popula-

tion. Comparing this with the situation before the Japan-China war of 1893-4, an increase of 33 per cent. in attendance in less than 10 years is apparent. The attendance of girls is nearly equal to that of boys. The number of teachers is over 90,000. The schools above the elementary grade seem to consist of a half-dozen secondary schools whose function is to prepare students for the Imperial universities at Tokio and Kioto, and for various art and industrial schools. The universities embrace faculties of law, medicine, engineering, literature, science, and agriculture. In 1903 the number of resident instructors in the University of Tokio was 222 and the number of students 2,880. There are many libraries and museums. Education seems not only to be pervasive but very intensive in Japan. The observation of other peoples by the Japanese is wide and keen, and they quickly adapt to their own ends whatever attracts their attention in other lands. The government has been accustomed to send the most prominent young men to European and American universities to be educated, but this hardly seems necessary any longer. However, the diplomatic representatives of Japan are exceedingly and uniformly alert in observing and reporting everything which may prove advantageous to the intellectual progress of the empire, and many special commissioners are sent abroad to study subjects of particular interest to the educational, military, and industrial activities of the empire.

Perhaps it ought to be observed here that in Japan, as in all governments where the form of government is so extremely monarchial and classes among the people are well defined, some education may be pretty nearly universal while all education is not so. This is much, very much, better than nothing, but it is not all. The system does not open the higher schools to the masses, or at least it does not encourage the child of the masses to seek their advantages. So much is ordinarily true of all nations where classes are distinctly differentiated. But it must be said that the educational system of Japan has at once come to be remarkably balanced and diversified. It expresses the traits and promotes the progress of a people with marked characteristics. The elementary part of the school system is not only universal but, better still, the mighty and conclusive power of the government is exercised to have the elementary schools provide the beginnings of learning to all the children, boys and girls alike. Since 1900 tuition in the elementary schools has been free. The training of the teachers is thorough, the discipline of the teaching force excellent, and the supervision is close and under immediate government control. The methods for enforcing attendance are effective and apparently there is no thought of evasion. This is surely putting monarchial government to its best uses and it is not for us to say that such a form of government, exercised for such ends, over such a people, is not quite as suitable as any other.

EDUCATION.

Great Britain and Ireland.—In England, Scotland, and Ireland we have our conspicuous illustration of a people who could set the limits to the power of the king, and establish government by the suffrage and under a constitution, without marked or general educational progress. From the beginnings of English history a small number of high grade universities with a few tributary fitting schools have trained the sons of the nobility, while the elementary education of the masses has been meagre, precarious, and lethargic. There has never been before the present generation—if indeed it may be said that there is now—any common school system in England. There have been elementary schools, upon one footing or another, nearly or quite everywhere, and the habit of sending children to school has been general, but these schools have not been under popular control, and they have not led up to higher institutions. They have lacked in self-activity, spontaneity, and aggressiveness. As a consequence the masses have the rudiments of learning, and this, with the strength and balance of the native character, means very much. But the fact remains that because the elementary schools have really had no connection with the schools above, the children of the masses are without educational opportunity and the educational system lacks in national coherency, strength, and elasticity.

Why is this so among such a great people who have done so much for freedom and constitutionalism? No doubt the answer is found in the prevalence of ecclesiasticism, in the measure of control which the Established Church exerts over the learning of the kingdom, and in the stubborn opposition of churchmen to forms of educational activity which are not at one with the fixed thought, plans, and ends, not of religion but of church organizations. Parliament has been struggling with this subject for generations. As democracy slowly advances to larger power in the parliament house and as the advantages of a free and articulated school system in other countries, and particularly in the United States, become obvious, more and more ground is gained—but the process is a slow one.

In England an act of Parliament passed in 1870 established school boards chosen at popular elections. The independence of these boards was very considerable and, therefore, their adaptability to particular conditions was marked. But by legislation in 1902–3 the local administration of schools of all grades was given over to the county, or county borough, council. Again the application of so much unification as this implies has been relaxed by excepting noncounty boroughs with a population of over 10,000 and urban district councils with a population of over 20,000, which the act declares to be entitled to control their elementary education. In 1891 an act was passed giving to every parent the right of obtaining free elementary education for his children between the ages of three and 15 and as certain schools

still continue to charge fees, the school boards are often put to their resources and ingenuity to find free instruction for all who demand it. Church schools are numerous. The conflict of interests between church schools and board schools, and between the adherents and supporters of each, are frequent, and the whole subject is a continuing source of acrimonious discussion and of unceasing educational uncertainty.

Beyond the elementary schools there are institutions of all kinds and grades. There is no organized system of secondary schools. As of yore the fitting schools for Cambridge and Oxford continue. The overwhelming, if not the fatal, defect in the English school system has grown out of English thought and history. It is that the universities and preparatory schools are to serve the aristocracy, and that any extension of these instrumentalities to the masses will unsettle and unfit them for service to the aristocracy. Accordingly, there is not only no settled and universal school system for elementary instruction, but there is no organic connection between such elementary schools as there are, and such secondary and university institutions as there are above them.

But this has not interfered with, perhaps it has promoted, the development of business and trade and technological institutions. The defeat of British industrial interests in the competitions at world's fairs in the present generation has undoubtedly served as an impetus to the progress of instruction bearing upon the nation's industries.

A word as to the compulsory features of the English elementary school system should be said. By an act passed in 1876 attendance was first made compulsory and subsequent acts have made the compulsory provisions more stringent. As a general rule it is now obligatory for children from the age of 5 to the age of 12 to attend school, and they must attend from 12 to 14 unless they are excused wholly or in part by reason of having passed prescribed examinations, or having attended with marked regularity before the age of 12. In 1893 the attendance of blind and deaf children between 7 and 16, and in 1899 the attendance of defective and epileptic children between the same ages, were made compulsory. Parents and guardians are made responsible for the attendance of children within the compulsory ages and are fined for delinquency, and employers who give work to children who are bound to be in school are fined heavily. The attendance laws seem to be very well enforced. Illiteracy is low. Exact data are not obtainable. In recent years only about one man in 40 and one woman in 40 have been unable to sign their marriage certificates.

No word of commendation bearing upon the historic English art and literary institutions, outside of the schools, which culture thought and give even added substance and warmer color to English character in general, and

particularly to the classes liberally educated, is needed here. They are many and great—a good part of the intellectual instrumentalities of the world.

The Scottish school system comes nearer to that of the United States than that of England does. It has come down from the times of John Knox. It undertook to establish a school under a qualified master in every parish and made the maintenance of the same a charge upon the land revenues of the district. The influence of the Scotch education department upon all educational activities in Scotland is very considerable. This is the government department which administers government grants in favor of education, which prescribes the general lines of organization, and fixes educational values. It acts through inspectors or others charged with particular duties. The primary schools are general and they seem more often to carry their work into what we call the secondary schools, than is common in England. Coeducation in all grades is common in Scotland and has been for a long time. The universities are strong and the Scotch character is strong. Many enter the universities from all walks of life. Scotch history supplies the reasons why democracy seems to be freer in Scotland than in England, and the results are obvious enough in the educational system. Still it must be said that the lack of organic connection—of the continuous road—between the elementary and the advanced institutions is obvious enough also, and it is of much moment from the American point of view.

Attendance upon the elementary schools from 5 to 14 years of age is exacted, but some exemptions are granted after 12 years of age. The responsibility is placed upon the parents, and the penalties include both fines and imprisonment. In 1890 the attendance of blind or deaf mutes was made compulsory. The sentiment of the people combines with the efficiency of the government to make attendance general, and the percentage of illiteracy is low.

As to education in Ireland there is not a very great deal to be said, but so much as may be said is exceedingly hopeful. There are some Americans who do not realize what great institutions and what fine educational instrumentalities may be found in Ireland. These of course appear in the principal cities and they minister to the higher classes. The poverty of many in the country, particularly in the southern part of the island, is a great hindrance to the universality of the elementary schools. Yet the government grants have become relatively liberal, and the determination to enforce the organization of and compel attendance upon the schools has become decisive in the last decade. The Irish Education Act of 1892 exacted the attendance of children over 6 and under 14 years of age, but some exemptions are granted to certain children over 11 years of age. It was said with authority in 1902 that the compulsory

provisions of the act were being satisfactorily enforced by committees in 131 different places. The general average of attendance is low but steadily improving. The government grant for primary education in Ireland for the financial year ending 1904, Mar. 31, was £1,000,000 sterling. It may be said rather confidently that whatever work is done is as a rule very well done, and that the sentiment of the people touching education is steadily improving and highly promising.

If this article laid any claim to being a history, or even a very exact description of national systems of education, it would be necessary to go into an examination of the British influence upon the intellectual life of the colonies and dependencies of the nation. It would be a profitable and perhaps a fascinating study. In several directions, particularly in Canada, Australia, and India, it would have a somewhat significant bearing upon world education. It is obviously impossible to enter this broad field at this time. But it must be said that wherever the flag of Britain has been raised, there schools have quickly resulted, and there order and system have led speedily to the generation of intellectual energy and to the diffusion of learning. Kipling's virile verse is not without sufficient reason:

> They terribly carpet the earth with dead
> And before their cannon cool
> They walk unarmed by twos and threes
> To call the living to school.

France.—There is a very completely organized and a well-nigh universal system of education in France. It has developed with marvelous rapidity since the Franco-Prussian War in 1871. It is hardly too much to say that it resulted from that war. In a great measure it did, but other contributing causes must not be lost sight of. It is an autocratic and in some ways a mechanical system, but it is autocratic and mechanical because of the necessities of the situation. It is a system which knows much of the history and philosophy of education and which puts to its uses the courses and the processes which the most enlightened educationists believe to be of the most worth in raising the level of a nation's intellectual and industrial capacity. It is not free from the incumbrances and hindrances peculiar to the political and religious history of the French Republic, but it seems to be freeing itself with truly spontaneous energy and elasticity, and the process has already gone so far that the danger of arrest or of retrogression has been practically eliminated.

The educational system of France has been marked by exactness, and the work it does is characterized by completeness. The state controls all. The Minister of Education is the autocrat of all things in the French schools. The differentiation of schools into primary, secondary, and higher is not only rigid but desirable. Next to the Minister there is a director over each of these sub-divi-

sions of the school system. These officers are aided by inspectors. The educational policies result very largely from a higher council, a dignified body of leading educators, which meets twice a year under the presidency of the Minister of Education. The members of the Council are appointed for four years. There are 60 members. Thirty are professors and representatives of the advanced schools. Six are chosen by officers of primary education. Four, who represent private instruction, are appointed by the President of the Republic on the recommendation of the Minister of Education. Five are elected by the *Institut de France* from its own membership. Nine councilors appointed by the President of the Republic and six designated by the Minister of Education constitute the 'permanent section,' which meets once a week. With some appropriate division of authority and responsibility, these bodies lay out the educational plans of the Republic and exercise very decisive control over the satisfactory and complete enforcement of those plans.

The teachers in the public schools must be of French birth and must meet the requirements fixed by law. The private schools are subject to government inspection and direction. A naturalized citizen may be authorized by the Minister to teach in a private school, but the exclusion of foreigners from even the private schools seems severe. There are more than 100 normal schools for training teachers, which practically supply all the teachers needed, and the system for examining and certificating teachers is elaborate and exacting.

The inspection of the schools is systematic and close. There are general and local inspectors in large numbers. The average is something like one inspector for 200 teachers, but by the increase in inspectors the number of teachers to an inspector is growing smaller. The inspection districts vary in size. The supervision of the normal and technical schools, of the manual training, and of gymnastics and military exercise is somewhat accentuated.

Coming to the schools themselves, it may be said that they exist everywhere. They are classified about as follows: (1) the mothers' schools for children from two to six years old, (2) the lower primary schools for children from six to thirteen, (3) the upper primary schools and complementary courses annexed to the lower primary schools for children who have completed the work in the latter schools, (4) the manual training schools, with courses at least three years long, which receive pupils from the primary schools and develop technical aptitude. They complete the instruction of the elementary schools for pupils apparently destined for industrial life, (5) classes for adults and apprentices where the instruction has practical reference to the trades.

The elementary schools are free, even the books, paper, pencils, ink, etc., being generally gratuitous. Even

more, food and clothing are sometimes provided. The expenditure for elementary schools is very large.

The work is generally excellent. It rests upon a philosophic basis and relates very decisively to the artistic tendencies which are always liberally present in the French people, and to manual dexterity. All the usual branches are well covered, with apparent emphasis upon drawing, work requiring the use of tools, the household arts, and music. Of course the out-croppings of militarism are often manifest. The branches which are simply culturing without manual labor are not neglected. The equipment of the schools, particularly in the cities, in apparatus and implements seems to be very abundant, and it is said that much of this is made by the pupils.

The secondary school system is apparently attaining rapid development, but it is yet immature. The universities are many, strong, and yet growing stronger. So far as the writer can see, there is lack of articulation between the lower and the upper schools. It seems to be closer between the lower and the middle schools. Certainly the greatest emphasis is thrown upon the primary schools.

Primary instruction is obligatory upon all children between 6 and 13 years old, unless in a particular case a child who is over 11 years of age is exempted by reason of his proficiency duly established. The instruction may be in a public or private school or in the family, but apparently the fact and quality of it must be indubitably established. Complete lists of children are continually maintained, and all upon the lists have to be accounted for. People in France are compelled to do things and they have got in the habit of it. Fifteen days before the opening of the school term the parent or guardian must notify the mayor of the commune whether his children of the attendance age will go to the public school, or to a private school, or be instructed at home. If the notice is not given the child is enrolled in the public school and the parent advised. Then the public school authorities must report on him. The only excuses accepted for absence are the sickness of the child, a death in the family, and some accidental and temporary break in communication. The penalties run against the parent or guardian, are sufficient, and the procedure is regular and as a matter of course. The percentage of illiteracy is not unreasonable and is improving. It is about one in 16, which, in view of the really recent origin of the French school system as now rated, is not unsatisfactory.

Switzerland.—There can be no treatment of the educational system of Switzerland which is both brief and exact. The country determined upon a universal system of primary schools nearly a century before England took that step. The obstacle to a brief description is in the fact that each of the 25 cantons has its own organization, and there is not much legislation of general application to the whole country. The Confederation makes free primary education compulsory, but leaves the limits and

details to the cantons. The Constitution forbids the employment of children in factories before they are 14 years old, with the further provision that in the 15th and 16th years the time given to work, to the 'continuation schools' and to religious instruction shall, taken together, not exceed 11 hours per day. This is important in view of the continuation and evening schools, at the latter of which attendance is often compulsory. The Federal Constitution also requires all boys between 10 and 15 years of age to be instructed in military drill and attendant exercises.

The primary schools are non-sectarian. The different cantons are somewhat distinguished by differences in national descent and in church tendencies. Both the Evangelical-Reformed Church and the Roman Catholic Church are recognized by the state, but the instruction in the primary schools is secular.

There are six universities, at Basel, Zurich, Geneva, Freiburg, Bern, and Lausanne, with foundations from 1460 to 1832. There are excellent academies at Freiburg and Neuchatel, and a strong polytechnic school at Zurich. The country is not at all lacking in libraries, art museums, and other stimulative incentives to learning. The different parts of the educational system seem to be correlated. The republican form of government gives an air of freedom to the whole which is not common in Europe.

The system for insuring the attendance of all children within the general ages from six to sixteen, with immaterial variations in the different cantons, is substantial and effective. The sentiment of the country supports the schools with remarkable universality. Illiteracy is practically unknown. Switzerland furnishes an excellent example to Europe of what a small republic can do for law and order and self-enlightenment as a people, and for individual opportunity, industry, and happiness.

Netherlands.—The Dutch educational system seems to have maintained a very uniform growth from the dark days in the latter part of the 16th century, when the nation set up not only common schools but universities in celebration of the military victories over the Spanish in the first really great and prolonged war for religious freedom, which almost unconsciously led into political freedom as well. The system now embraces schools of every kind and grade, including good secondary, technical, and normal schools, and four state universities, which are ancient in origin and much regarded. Since 1857, and particularly since 1878, the instruction in the primary schools has been undenominational. Attendance has been obligatory since 1900, and the people who cannot read or write are about one in forty of the population. The expense and management of the schools are divided between the general and the state governments. Institutions bearing upon the agricultural and mechanical industries are by no means lacking, and fine libraries,

museums, and architecture, evidence, while they aid, a substantial and assiduous people.

Denmark.—The educational system of Denmark diffuses throughout the kingdom a grade of learning very well suited to such people. Primary schools are common but not free, except to the poor. Attendance is compulsory between the ages of seven and fourteen. Illiteracy is almost a negligible quantity. The established religion is Lutheran and it embraces almost the entire people, but other denominations are tolerated. Denmark seems to excel in secondary schools. Technical and professional schools are common. The country is essentially agricultural, and the fact is plainly discernible in the strong points of the educational system. At the head of the system stands the University of Copenhagen. The Royal Library at Copenhagen has 500,000 volumes and is exceptionally rich in original manuscripts. There are two other public libraries in the city. Matters are managed very exclusively by the state, and the level of intelligence and thrift seems high.

Norway.—The primary school system of Norway seems to reach all the people effectively. It embraces a seven-year course suited to children from seven to fourteen years old. It is a national system; is free, and attendance is compulsory. The distinguishing feature of the elementary school system seems to be a class of 'ambulatory schools,' which are moved about from place to place in the thinly-settled districts. Beyond the primary schools the towns have superior schools of all grades and kinds. There are six teachers' seminaries. At the head of all is the Royal University at Christiana, founded in 1811. The state religion is Lutheran, but all denominations are tolerated.

Sweden.—There is practically no illiteracy in Sweden. The statistics show less than one illiterate in a thousand of population, and so much is said to arise from a few Finns in the extreme north. Of the conscripts in the army in 1900, 69.8 per cent. could read 'fluently,' and 30.2 per cent. 'fairly well.' This tells the story of the national system of education. Probably no country in the world gives more exact and persistent attention to education than Sweden is now giving. The Common School Statute of 1897 requires at least one primary school in every district. Where large enough, at least two grades of instruction are maintained, viz., an infant school for beginners and a common school proper for the more advanced pupils. In the former the instruction is arranged for two, and in the latter for four years. Attendance is, of course, compulsory. It must be from seven to fourteen years of age. The responsibility is upon parents and guardians, and the school board is by law bound to see that the obligation is fulfilled. If children are deficient of the required knowledge after passing the ordinary time in school, they must continue until they can meet the state's requirements. No ob-

stacle—not the sickness or poverty of parents, not even the need of their labor to earn the family bread—is allowed to come in the way of every child being required to possess the elements of learning. If necessary, the child is given to the care of others and the expense forced from the parent or guardian.

The state pays exceptional attention to the defectives—the deaf, and dumb, and blind. This training is compulsory, also. Deaf and dumb schools are established on a large scale, and the state bears the expense. This extends not only to the defectives, but also to the disabled.

The trend of education in the country seems toward training every boy and girl to read and write, to attend to household duties, and then to make useful things with his or her hands. The obligatory subjects of instruction are religion, the Swedish language, arithmetic, geometry, geography, history, natural science, drawing, gymnastics, gardening. The expenses are borne by national grants and local taxes.

Secondary schools also form a part of the public school system, and a national university at Upsala exercises a very considerable influence upon the whole. The system is ancient, substantial, and comprehensive.

Germany.—For the long established, territorially extended, philosophically organized, capably directed, thoroughly accepted, and notably efficient, national system of education in Europe we must go to Germany. And if we were to undertake the exact study of any one system of German schools we must go to that great leader which embraces much more than half of the territory and population of the 26 German States which comprise the German Empire, established by the peace with France in 1871—*Prussia.* This is not saying that the Prussian school system is better than any other in Germany; only that it is the oldest, the largest, the most comprehensive, and, therefore, the subject of the most interesting study.

The laws of the empire provide for primary schools in every city, town, and village. As a result there are something like 60,000 of these primary schools, with 125,000 teachers and over 8,010,000 pupils. These schools are supported by some local rates and by much government aid. Parents are compelled to send their children from six to fourteen years of age to a primary school. One of the strongest points in German life is the very nearly universal and thoroughly established habit of sending the children to school. Compulsory attendance has been in operation for 63 years in Prussia. It is much for a mighty people to assume by common understanding that none but an imperative cause is to keep a child from school a single day when he ought to be there, and that nothing whatever is to be allowed to rob him of his right to an elementary education. This is apparently the case in Germany, and as a consequence the

rate of illiteracy is diminished almost to the vanishing point.

Kindergartens are common in Germany, but are ordinarily if not invariably carried on by private enterprise.

'Continuation schools' are provided for the children of the working classes who want to do more work than is provided in the primary schools. They provide courses for two and three years and their work runs into trade instruction.

The regulations touching primary school-houses in Prussia illustrate the national estimate of the importance of educational details. Of course there are many buildings which were erected before the modern regulations were deemed necessary, and such regulations are not always enforced in Prussia, but they are quite suggestive enough. The building is to be erected in a sunny and dry open space, away from the most-used streets. In the cities the interior of the block is preferred. Quiet is imperative. Good water is sought. Playgrounds are demanded. If the building has more than one story the youngest children have the ground floor. In building anew, provision must be made for enlargement. Every detail of construction is specifically treated. Use of new buildings is prohibited until thoroughly dry; in stone and brick buildings six months is allowed. The size of rooms is regulated; even the shape of rooms is regarded. So, too, is the size, form, and location of doors and windows. Heating and ventilation are specifically treated. The width and length of halls and the width and height of stairs are specified. The form and situation of desks; the height, width, and depth of the platform upon which the teacher's desk stands, and the need of hooks and pegs for hats and coats are all set forth.

Of course a national system which regards all these small matters touching the school accommodations with reference to the health, eyesight, and convenience of teacher and pupils, cannot neglect the details of the courses pursued or the sufficiency of the instruction; and it does not.

Secondary schools are found everywhere. Their work is varied but leans toward the classical, the culturing, the professional, and their line of cleavage is quite clearly a social one. Provision is made for the secondary education of girls as well as of boys.

Then follows a large variety of advanced special schools, such as schools for defectives, academies of forestry, polytechnics, schools of agriculture, of mining, of architecture, of art, and of music. There are more than 250 normal schools for training teachers.

Above all the rest there are 21 universities, some of them with just reputations which have attracted students from all parts of the educational world. In 1900 there were 2,800 teachers and 34,000 students in these universities.

EDUCATION.

The fundamental and distinguishing characteristics of this mighty system of education may perhaps be enumerated as follows: (a) the full and regular attendance of children of school age; (b) the habit of uniform obedience to the state's authority; (c) official exactness concerning the quantity of the work to be done in each grade of schools; (d) uniformity in the work of each grade, with 42 to 45 weeks of work in a year; (e) the fact that each grade of school leads to something beyond, to work as much as to higher schools; (f) that the 'something beyond' is suited to whatever manner of life the child is likely to lead; (g) the adequate preparation of the teachers, the exclusion of immature or unprepared teachers, the certain tenure of teachers, and the consequent dignity of the teacher and his work; (h) the inspection of private teaching and the assumption of entire responsibility for the education of the country by the government; (i) the apparently open opportunity for all, accompanied by a marked contentment with one's situation and a readiness to do what is reasonably within the reach of one's station in life; (j) a very considerable evenness of educational instrumentalities and opportunities in all parts of the empire; (k) very many heights of scholarship which are not outranked by any in the world; (l) deep and common civic responsibility for the character of the schools.

In the work of the German schools the ordinary work in American schools is included, but special emphasis is laid upon physical exercise and militarism, upon drawing and manual skill, upon needlework and other domestic arts, and upon music. Everything is done to nourish love for the Fatherland. The portrait of the Emperor is required to be displayed in every schoolroom. The national songs are sung often and well. The accomplishments of the nation are well told. Everything is done for contentment, for scientific scholarship, for industrial productivity, for military efficiency, for the happiness, oneness, strength, and greatness of the German Empire.

Mention of the important fact that religion is a vital part of the primary school curriculum of Germany must not be omitted. Whether the child goes to a public school or a private school, or is instructed in the family, the state demands that he be instructed religiously. If the school be one of Protestants, Roman Catholics, or Jews, the master must see that the religious instruction conforms to the religious preferences, and whoever gives any instruction, including the religious, must have the authority of the government behind him. If the schools are mixed religiously, the instruction must accord with the beliefs of the greater number; perhaps in some case the dogma and doctrine are somewhat mixed, too; more likely the religion is not so theological as some would make it. The clergymen are in a sense representatives of the state. The greater number receive a considerable

part of their salaries directly from the state. They have been educated in the different grades of the schools, including the divinity schools of the universities, and are easily adaptable to the needs of German religious education.

In view of the purely non-sectarian character of American public schools and of the frequent discussion of religious training in this country, it is interesting to notice how the German law treats the matter. The following are among its provisions: The character of the religious instruction is determined by the father. Where the father and mother are of different denominations an agreement made before marriage to train the children in the religion of the mother has no legal effect. On the death of the father the instruction must continue in his faith and no death-bed conversions to a different faith are recognized. On the death of the father the court must attend to the matter. Children born out of wedlock must receive religious instruction in the faith of the mother. After 14 years old children may decide for themselves as to the denomination they will affiliate with. Before 14 no denomination is allowed to receive a child or permit a confession of faith other than that to which the child belongs by law.

The reader needs no assurance that a people doing so much for schools of every grade from the kindergarten to the university has accumulated many and great aids to information and culture outside of the schools. We know it would be so and that it is so. The libraries, museums, art galleries, architecture, palaces, mausoleums, and monuments of the Germans fittingly augment and round out their system of education: see EDUCATION, AMERICAN SCHOOL SYSTEM.

EDUCATIONAL JOURNALISM, like other trade and professional journalism, arises from the need of intercommunication. As to support it includes (1) the official organ, like Barnard's *Connectieut Common School Journal* (1838-42, 1850-54) and Horace Mann's *Common School Journal* (1838-52), to convey instruction, information, and advice from the head of the state educational department, issued usually at the expense of the state and free, like the French *Bulletin Administratif du Ministère de l'Instruction Publique* and the *Revue Pedagogique* (Paris, 1882-), or, like the *New York District School Journal* (1840-52), and, till recently, the *Pennsylvania School Journal* (1852-), subsidized by payment through the state of subscriptions to the school districts; (2) the organ of a voluntary association, which either assumes the entire responsibility, as in the *Journal d'Edueation publié par la Société formée a Paris pour l'amelioration de l'enseignement elementaire* (1815-17), the *Journal of the Rhode Island Institute of Instruction* (1845-7), and in its early years the *New York Teaeher* (1852-67), or sustains the publisher by its support and influence, like the *Massaehusetts Teacher* (1846-74), the *Rhode Island Schoolmaster* (1855-74), and

La Revue Internationale de l'Enseignement (Paris, 1881-); or (3) an individual enterprise, relying only upon individual subscriptions. In America only this last class has proved permanently successful.

As to character, it includes (1) the gossipy newspaper, telling of promotions, changes, marriages, deaths, and other occurrences of personal interest to a limited circle, like *School* (New York, 1889-); (2) the viewspaper, in touch with the best thought on topics of immediate importance and looked upon by the teachers of its field as their mouthpiece and representative, the ideal of most of the state journals and typified in the London *Journal of Education;* (3) the help-paper, giving each week or month devices, suggestions, pictures, exercises, blackboard illustrations, examination questions and answers, and the like, ready for immediate use by the teacher in his daily work, such as *Allgemeine Schul-Zeitung* (Leipzig, 1824-), *Der österreichische Schulbote* (Vienna, 1851-), *Der praktische Schulmann* (Leipzig, 1852-), *Journal des Instituteurs* (Paris, 1878-), and *L'Instruction Primaire* (Paris, 1879-). Most educational journals unite to some extent all three of these characteristics, like the *Manuel Général de l'Instruction Primaire* (Paris, 1832-), and *Preussiches Schulblatt* (1871-).

As to audience, it varies not only in extent of locality but in class, some journals being intended for all teachers, and others for kindergartners, like *Ami de l'Enfance* (Paris, 1839-), for primary teachers, secondary teachers, like *L'Enseignement Secondaire des Jeunes Filles* (Paris, 1882-), for teachers of mathematics, of modern languages, of geography, of the deaf or blind, etc.

There was an educational journal in France as early as 1789, but the first in America was *The Academician* (New York, 1818-19), published by Albert and John W. Picket, president and corresponding secretary of the Incorporated Society of Teachers. It was a semi-weekly octavo of 16 pages at $3 a year. It introduced to American teachers the systems of Lancaster and of Pestalozzi, and was edited with high purpose. So was William Russell's *American Journal of Education* (1826-30), continued by William C. Woodbridge, William A. Alcott, and others in *Annals of Education* (1831-9). This elicited the support of men like Daniel Webster, John Quincy Adams, and Edward Everett, but did not command subscriptions enough to pay expenses.

Undaunted by previous failures Henry Barnard gave up his fortune and a promising political career to establish a second *American Journal of Education* (1855-86), his especial original purpose being to introduce in this country the great educational works of European reformers. Of foreign pedagogical standards a large proportion can still be found in English only in its pages, and this generation will not see another educational cyclopedia that can compare with it. Dr. Barnard published it amidst crushing disappointments and at enormous sacrifice, but the

result is permanent, for he electrotyped it, and sets can always be furnished. Of American journals the following have been published for 25 years or more: *Ohio Educational Monthly* (1852-), *Pennsylvania School Journal* (1852-), *Wisconsin School Journal* (1871-), *School Bulletin* (Syracuse, 1874-), *New York School Journal* (1874), *New England Journal of Education* (Boston, 1875-), *Teachers Institute* (New York, 1877), *Michigan School Moderator* (1880-), *Missouri School Journal* (1883-), *Education* (Boston, 1880-), *American Primary Teacher* (Boston, 1883-).

The *Educational Review* (New York, 1891-) is representative of the best educational thought of the country, and the *School Review* (Chicago, 1893-) is the acknowledged organ of secondary teachers. In the *Pedagogical Seminary* Dr. G. Stanley Hall reaches a thoughtful audience. The *Journal of Pedagogy* (Syracuse, 1887-) is a dignified journal of recognized standing. The *Western School Journal* (1885-) is the successor of the educational journals of Kansas, the *Educator-Journal* of those of Indiana, and *School and Home* (1886-) of those of Illinois. Not only most states and the larger cities support such journals, but most colleges and secondary schools have journals of their own, several colleges maintaining daily newspapers.

EDUCATIONAL SYSTEMS. See EDUCATION; AMERICAN SCHOOL SYSTEM; EDUCATION IN THE UNITED STATES; EDUCATION, NATIONAL SYSTEMS OF; COLLEGES IN THE UNITED STATES; SOUTHERN STATES, EDUCATION IN THE; KINDERGARTEN; MORAL TRAINING IN SCHOOLS AND COLLEGES; NATIONAL EDUCATIONAL ASSOCIATION; NORMAL SCHOOLS; SCHOOL LAW; STATE SUPERVISION SPECIAL METHODS OF EDUCATION; SCHOOL ORGANIZATION AND ADMINISTRATION; SCHOOL MANAGEMENT AND DISCIPLINE; SCHOOL PROGRAMS; TRAINING SCHOOLS FOR TEACHERS; TEACHERS, TRAINING QUALIFICATIONS OF; SCHOOLS, CITY SUPERVISION OF; SCHOOL GARDENS; VACATION SCHOOLS; etc.

EDUCE, v. *ĕ-dūs′* [L. *educĕrĕ*, to bring up, to rear—from *e*, out of; *dūcō*, I lead; *ductus*, led]: to bring or draw out; to bring to light; to elicit; to develop. EDU′CING, imp. *-sĭng*. EDUCED′, pp. *-dūst′*. EDUCT, n. *ē′dŭkt*, that which is brought to light by separation or analysis: the term is employed in *chemistry* to indicate that the body to which it is applied is separated by the decomposition of another in which it previously existed as such. It thus stands in opposition to *product*, which denotes a compound not previously existing, but formed during decomposition. Thus, the volatile oils which pre-exist in cells in the fruit and other parts of plants, and oil of sweet almonds obtained by pressure, are educts; while oil of bitter almonds, which does not preëxist in the almond, but is formed by the action of emulsine and water on amygdaline, is a product. EDUCTION, n. *-dŭk′shŭn* [F.—L.]: the act of educing or bringing into view. EDUC′TOR, n. *-tĕr*, that which extracts.

EDWARD I.

EDWARD (or EADWARD) I., THE ELDER, King of the Anglo-Saxons: abt. 871-925: eldest son of Alfred the Great. When 22 years old he distinguished himself as a soldier by inflicting a disastrous defeat upon the Danes at Farnham, and at the age of 30 succeeded his father by the voice of the Witan. His claim to the throne, however, was disputed by his cousin Ethelwald, who raised a body of Northumbrian and East Anglican Danes and carried on a civil war for 4 years, when he fell in battle 906. By the aid of his sister, Ethelfleda, Edward accomplished the complete subjugation of the Danes, and became king of all England s. of the Humber.

ED'WARD THE CONFESSOR, King of the Anglo-Saxons, abt. 1004–1066, Jan. 5 (reigned 1042–66); b. Islip, in Oxfordshire. On the death of his father, Ethelred, 1016, Canute the Dane obtained possession of the throne, and in the following year married Emma, mother of Edward, by whom he had two sons, Harold and Hardicanute. Until the death of Canute 1035, Edward lived in Normandy; he then made an ineffectual attempt to establish his authority in England; but his mother Emma had now transferred her affections to her younger children; and she exerted all her influence and energy in favor of Hardicanute, who, on the death of his brother Harold 1040, became sole ruler of the Anglo-Saxon kingdom. Hardicanute, however, was generous enough to invite his half-brother to England, whither accordingly Edward went, and was honorably received. On the death of Hardicanute 1042, Edward was declared king. The person chiefly instrumental in bringing about this result was Earl Godwin, whose only daughter, Editha, was married to the king 1044. The lady became only his queen, not the partner of his bed. For this asceticism, the honor of canonization, and the title of Confessor, was conferred on him, about one hundred years after his death, by Pope Alexander III. The whole of Edward's reign is the record of the growth and struggles of the Norman or court party with the national or Anglo-Saxon party; for an account of which see GODWIN; HAROLD. Edward's wars with the Welsh 1057 and '63, and with the Northumbrians 1065, were short and successful. At his death he was succeeded by Harold, son of Earl Godwin.

ED'WARD I, King of England: 1239, June 16—1307, July 6 (reigned 1274—1307); b. Westminster: eldest son of Henry III. by his wife Eleanor, daughter of Raymond, Count of Provence. That union of valor and intelligence which characterized him was manifested at an early period. At the commencement of the struggle between Henry and his barons, Prince Edward, then governor of the duchy of Guienne, came over to England, and boldly declared his dissatisfaction with his father's conduct. Subsequently, he took the king's side in the war, and by his vigorous generalship put an end to the insurrection in a few years. When the last of the Crusades

was organized, at the instigation of Pope Gregory X., Prince Edward arranged with Louis, king of France, to take part in it. Louis died before reaching Palestine, but Edward landed at Acre 1271. Nothing, however, of any consequence was achieved; and in the following year he set out on his return to England. At Messina, he heard of his father's death whereupon he proceeded to France, and did homage to Philippe III. for his French possessions, arriving in England 1274, July 25. He and his queen, Eleanor, were crowned at Westminster Aug. 19. His first military expedition, after accession to the throne, was against the Welsh. After a contest of nearly ten years—in the course of which the famous Prince Llewellyn was slain at Lanfair, 1282, Dec. 11—Wales was finally subdued and incorporated with England. His next ambition was to possess himself of Scotland. The death, in 1290, of Margaret, granddaughter of Alexander III. and known as the Maiden of Norway, who was to have been married to Edward's son, seemed to have frustrated his design; but the selfishness of the ten competitors for the Scottish crown who now appeared, induced them to acknowledge Edward as *Lord Paramount* of Scotland, each hoping that he would thereby secure the English monarch's support. The competitors were also foolish enough to make him umpire among them, and Edward decided in favor of John Baliol at Berwick, 1292, Nov. 17; and Baliol immediately took the oath of fealty to him; and on Dec. 26, at Newcastle, did homage to the English king for his crown. The patriotism and pride of the Scottish nation took fire at such humiliation, and in a short time Baliol was hurried by his subjects into a war with England. In 1296, Edward entered Scotland, devastating it with fire and sword. He penetrated as far north as Elgin, compelled Baliol to resign the kingdom, and governed the country by means of his own officers. It was during this expedition that he carried off from the cathedral of Scone the celebrated stone on which the kings of Scotland used to be crowned, and which is now in Westminster Abbey. A second rising took place in Scotland in the following summer. The leader on this occasion was William Wallace (q.v.), whom tradition represents as the most heroic and unselfish of patriots. He was completely successful for a time, chiefly it is to be supposed on account of the absence of Edward. In the spring of 1298, however, that sovereign again made his appearance in Scotland, and gave battle to Wallace at Falkirk, July 22. Partly through treachery, and partly, no doubt, through the superior generalship of Edward, who is considered to have been the first military commander of his time in Europe, the Scottish forces were entirely defeated. The next five years were spent by the English king in reducing the country to obedience—with very imperfect success, however. In the summer of 1303, he led a third large army into Scotland, and once more spread havoc and ruin to the shores

of the Moray Firth. The last castle that held out against him was Stirling, which did not yield till 1304, July 20. Edward wintered at Dunfermline. Some time after this, Wallace either fell into his hands, or was betrayed, and 1305, Aug. 23, was hanged, drawn, and quartered as a traitor, at Smithfield, in London. Edward now probably thought that he had no further danger to dread from Scotland, but if so, he was quickly undeceived. Robert Bruce, Earl of Carrick, grandson of the chief rival of Baliol, suddenly left the English court, where he had been residing, in the beginning of 1306, unfurled once more the banner of Scottish independence, and Mar. 27 was crowned at Scone. An English army, under the Earl of Pembroke, was immediately dispatched to Scotland; and at the close of the year, the king himself set out to chastise Bruce. But he lived only to reach Burgh-on-Sands, a village beyond Carlisle.

ED'WARD II., King of England: 1284, Apr. 25—1327, Sep. 20 (crowned 1308, Feb. 25); b. Caernarvon, in Wales; son of Edward I. In 1301 he was created Prince of Wales, being the first heir-apparent of the English throne who bore that title. He accompanied his father on his various expeditions into Scotland, and on the death of the latter at Burgh-on-Sands, 1307, led the English army as far n. as Cumnock, in Ayrshire, after which he returned to his own country. While still a youth, he had conceived an extraordinary admiration and fondness for a witty, clever, but dissolute creature called Piers Gaveston, son of a Gascon knight. After he became king, there was no limit to the honors heaped on the favorite. When he went to France, in the beginning of 1308, to conclude a marriage with Isabella, daughter of Philippe V., king of France, Gaveston was left guardian of the kingdom. The nobles were indignant, and demanded his banishment. Twice was Gaveston forced to leave England, but as often was he recalled by the weak monarch, whose love for him was sheer infatuation. At last the nobles rose in arms, besieged Gaveston in Scarborough Castle, and having forced him to surrender, hanged him at Warwick, 1312, June 19. Two years after this, Edward invaded Scotland at the head of the greatest army ever collected in England—amounting, according to some historians, to 100,000 men. At Bannockburn, 1314, June 24, he was encountered by Robert Bruce (q.v.) and defeated with immense slaughter. This victory put Scotland and England on equal terms and caused the giving up of the attempt at military subjugation of the former country by the latter. Finally, 1319, after numerous petty successes on the part of the Scotch, Edward concluded a truce with them for two years. He now exhibited again his imbecile passion for favorites. The person selected on this occasion was Hugh le Despencer. Once more the nobles rebelled, and both Hugh le Despencer and his father were banished 1321, July, but some months later, were recalled by Edward, and many of the nobles,

among others, the Earl of Lancaster, were beheaded in the following year. Immediately afterward Edward invaded Scotland for the last time, and penetrated as far as Culross, in Perthshire; but achieving no great success, he concluded a truce with that nation for 13 years, and returned to England. A dispute now arose between him and Charles IV. of France, brother of his wife Isabella, in regard to the territories which he held in that country. Charles seized them, whereupon Edward sent over Isabella to remonstrate, and, if possible, to effect an amicable arrangement between them. Isabella, it appears, despised her husband, and disliked the Despencers. Meeting at the French court many English nobles who entertained similar feelings, she was easily induced to make common cause with them against her husband and the Despencers. Having obtained possession of the young Prince of Wales, afterward Edward III., she embarked from Dort, in Holland, with a large body of malcontents, and landed in the Orwell, Suffolk, 1326, Sep. 22. The queen and the banished nobles were soon joined by most of the eminent persons in England. Edward fled, but was taken prisoner at Neath Abbey, in Glamorganshire; the Despencers, father and son, were put to death; and the monarch himself, after being formally deposed 1327, Jan. 25, was murdered in Berkely Castle, Sep. 20.

ED'WARD III., King of England: 1312, Nov. 13—1377, June 21 (reigned 1327–77); b. Windsor; son of Edward II. He ascended the throne on the formal deposition of his father. During his minority, the country was governed nominally by a council of 12 nobles and bishops, but really by Mortimer and his paramour Isabella, Edward's mother. The young king, 1328, Jan. 24, married Philippa, daughter of the Earl of Hainault; and two years later resolving to take the power into his own hands, he seized Mortimer, and put him to death, 1330, Nov. 29, and banished his mother, Isabella. He next invaded Scotland, to assist Edward Baliol, son of John Baliol, who, in the confusion that ensued on the death of the great Bruce, had made a descent on the country, and had been crowned at Scone. A bloody battle was fought at Halidon Hill, near Berwick, 1333, July 19, in which the Scots were completely defeated. Baliol now assumed the authority of a king, and did homage to Edward for his possessions, in consequence of which he was forced to flee the kingdom in a few months. In the course of three years, Edward thrice invaded Scotland, but he could not break the invincible spirit of the people. But the scene of Edward's great exploits was France. Charles IV. having died without a son, Philippe of Valois, nearest heir by the male line, ascended the throne, under the title of Philippe VI. Edward claimed the crown in right of his mother Isabella, sister of Charles; but the law of France expressly excluded females from sovereign rights. The English king admitted that his mother, as a woman, could not inherit the crown of France, but affirmed that he, as her *son*,

might. Edward declared war against Philippe 1337. His first campaign was not remarkable; but in 1346, accompanied by his eldest son Edward, known as the Black Prince, he again invaded France, conquered a great part of Normandy, marched to the very gates of Paris, and 1346, Aug. 26, inflicted a tremendous defeat on the French at Crécy (q.v.). After some further successes, such as the reduction of Calais, a truce was concluded between the two nations for several years. Meanwhile, the Scots had sustained a severe defeat at Neville's Cross, near Durham, their king (David) being taken prisoner. In 1356, the war with France was renewed, and Sep. 19, the Black Prince obtained a brilliant victory at Poitiers, King John of France (Philippe having been dead for some years) falling into his hands. The Scotch monarch was released for a ransom of £100,000 in 1357, and King John in 1360, when a peace was concluded between the French and the English, by which the latter were to retain their conquests. King John, however, finding it not consistent with the honor or desire of his country that such a peace should he carried out, magnanimously returned to captivity, and died in London, 1364, Apr. 8. Shortly before this date, David, king of Scotland, entered into a secret agreement with Edward, in virtue of which his kingdom—if he died without male issue—was to be transferred to the English sovereign. Meanwhile, the Black Prince, who had married Joanna, daughter of the Earl of Kent, had received from his father Aquitaine and Gascony, and ruled there for some time very prosperously; but ultimately involving himself and his father in a war with France, which was disastrous in its issues, he was compelled, 1374, to conclude a truce for three years. Edward waged war no more. In spite of his brilliant victories, in spite of the dazzling valor of his son, he was at the last unsuccessful. Neither in Scotland nor in France nor at home did he realize his desires. He quarrelled with his parliaments, and the Black Prince led the opposition. The latter, however, died 1376, June 8. Edward himself died the next year, after a reign of 51 years.

ED'WARD IV., King of England: 1441, Apr. 29 (or 1442, Sep.)—1483, Apr. 9 (reigned 1461–1483); b. Rouen, France; son of Richard, Duke of York, and great-grandson of Edmund, Duke of York, who was the 5th son of Edward III. His original title was that of Earl of March. It is impossible briefly to clear the path through the jungle of family relations by which Richard Duke of York, father of Edward IV., traced his right to the throne. Suffice it to say, that in 1460 the bloody struggle between the *Yorkists* (the party headed by Richard Duke of York, who at first professed only a desire to remove from the king, Henry VI., his pernicious councillors) and the *Lancastrians* (the party of the sovereign) ceased for a moment. The Yorkists, on the whole, had been victorious on the battle-field, and their leader contrived to induce parlia-

ment to appoint him Henry's successor. Shortly afterward, however, Henry's wife—the brave Queen Margaret—raised an army in the north, and, 1460, Dec. 31, encountered and overthrew York on Wakefield Green, the duke himself being slain. But this reverse was compensated for by the success of his son Edward, who, after routing the royal or Lancastrian forces, under the Earls of Pembroke and Ormond, at Mortimer's Cross, near Hereford, marched toward London, which he entered 1461, Feb. 28. He immediately presented his claim to the crown to parliament, which admitted its validity, and on Mar. 4 ascended the throne as Edward IV. For three years he had to struggle to keep his position. His first victory over the Lancastrians was at Towton, in Yorkshire, 1461, Mar. 29, hardly one month after his accession. Finally, 1464, May, a few days after the victory at Hexham, Henry himself fell into Edward's hands. This closed the war for a time. About this time, Edward married Elizabeth Woodville, widow of Sir John Grey. This marriage gave great offense to the Earl of Warwick, by far the most powerful of Edward's adherents, who was at that time prosecuting an alliance between Edward and the sister-in-law of Louis XI., king of France. In 1469, Warwick openly declared against him, joined Queen Margaret, and compelled Edward to flee the country. King Henry was released from the Tower, where he had been a prisoner for six years, and once more invested with royal authority. But in the spring of 1471, Edward landed at the Humber, proceeded swiftly to London, seized the person of Henry, and was again hailed king by the inhabitants. Warwick now gathered an army, and hurried to encounter him. The two met at Barnet, where Warwick was defeated and slain, 1471, Apr. In the course of the next month, Edward routed the Lancastrians at Tewkesbury, capturing both Queen Margaret and her son, Prince Edward. The latter was murdered the day after the battle; the queen, herself, after an imprisonment of four years, was ransomed by the French monarch. The later years of Edward's reign presented few political incidents of any moment. It was during his reign that printing was introduced into England, also silk manufactures.

ED'WARD V., king of England: 1470, Nov. 4—abt. 1483, June, son of Edward IV. The story of his life is brief and tragic. At the death of his father, 1483, Apr. 9, he was living at Ludlow, in Shropshire, a boy of 13. When the news reached Ludlow, Earl Rivers, his uncle by the mother's side, set out with him for London. Richard Duke of Gloucester, however, contrived to obtain possession of his person at Northampton, and brought him to the capital himself, in the beginning of May. Toward the end of the same month, Richard was appointed Protector of the kingdom. About the middle of June, the young Duke of York, brother of Edward V., also fell into his hands. The two hapless boys were then removed to the tower and were never more heard of.

ED'WARD VI., King of England: 1537, Oct. 12—1552, July 6; b. Hampton Court; son of Henry VIII. by his wife Jane Seymour. The events which happened during his brief reign were of great importance, but they were brought about by others, Edward being too young (not 16 years old at his death) to exercise any personal influence on the statesmen or the tendencies of his age. On the death of Henry in 1547, Edward Seymour, Earl of Hertford, became Protector of the kingdom. He was attached to the principles of the Reformation, and during his rule, great strides were made toward the establishment of Protestantism in England In war, Seymour showed himself a brave general. During the first year of his protectorate, he invaded Scotland, on account of the refusal of the Scottish government to fulfil the contract into which it had entered with Henry VIII., by which it was agreed that Mary Queen of Scots should marry Edward. The battle of Pinkie followed, 1547, Sep. 10, in which the Scots were completely beaten; and Seymour, now Duke of Somerset, might have inflicted most serious damage on the whole country if his presence had not been required at home. He returned to find that his brother, Lord Seymour, had been caballing against him. Somerset had him arrested, tried, and condemned for treason, and he was beheaded on Tower Hill, 1549, Mar. 20. In the summer of the same year the Protector quelled an insurrection of the populace headed by one Kett, a tanner; but after a few months, a more dangerous adversary appeared in the person of John Dudley, Earl of Warwick, whose party, by dint of insinuations against Somerset, excited the nation against him, and at last compelled the king to sign his deposition. Somerset was placed in the Tower 1551, Oct. 14, and on Dec. 1 he was tried before the house of lords for treason, condemned, and put to death 1552, Jan. 22. The people regretted, with good reason, his death, for Dudley was both a worse and a weaker man. Before Somerset's execution, Dudley had been created Duke of Northumberland. His great aim was to secure the succession to the throne of England for his family. With this view, he married his son, Lord Guildford Dudley, to Lady Jane Grey, daughter of the Duchess of Suffolk, to whom, by the will of Henry VIII., fell the crown, in default of issue by Edward, Mary, or Elizabeth. Northumberland now worked upon the weak and dying Edward to exclude Mary and Elizabeth, and nominate Lady Jane Grey as his successor. Edward at last consented, and a document settling the succession on this lady was drawn up 1552, June. The king lived only a few weeks afterward. Subsequent events entirely frustrated Northumberland's design. King Edward, during his short reign, founded many grammar schools.

EDWARD VII. See ALBERT EDWARD.

EDWARD THE BLACK PRINCE: 1330, June 15—1376, June 8; b. Woodstock; eldest son of Edward III. and

Prince of Wales, surnamed from the color of his armor He was created Duke of Cornwall 1337, and Prince of Wales 1343, and after the battle of Crécy, 1346, adopted the crest of three ostrich feathers and the motto *Ich dien*, 'I serve,' which had been borne by King John of Bohemia, who was slain in that battle (see EDWARD III.). This crest and motto has ever since been borne by the Prince of Wales. In 1361, his father consolidated all his dominions between the Loire and the Pyrences into one principality, and gave it to him with the title of Prince of Aquitaine. He lived a quiet life in his new possessions some years, and was then drawn into Spanish politics. Pedro the Cruel had taken refuge in his dominion, and Edward undertook to restore him to his throne. He marched to the frontiers of Castile, met and defeated Henry de Transtamare in battle between Navarette and Najera, restored Henry's rival, Pedro, to the throne, failed to obtain the stipulated recompense, and returned to his possessions with a bankrupt treasury. The taxes he was forced to levy to defray the expenses of this campaign, and to maintain the splendor of his court, made him very unpopular and almost caused open rebellion. The city of Limoges was treasonably surrendered to the French, and when the king of France ordered Edward before him to answer the complaints of his vassals, 1369, he took the field with an army of 60,000 men, and finding that the French generals were avoiding an engagement recaptured Limoges, burnt it, and had all its inhabitants killed. Shortly afterward he returned to England. He left a son who became King Richard II.

EDWARDS, *ĕd'wĕrdz*, AMELIA BLANDFORD, LL.D., L.H.D.: 1831–1892, Apr. 15; author; b. London, Eng. She became known as a contributor to periodical literature 1853, and since then, though known best as a novelist and traveller, wrote many juvenile and educational works besides contributing art and dramatic criticisms, book reviews, and political leaders to the foremost English daily and weekly papers. Her productions in these departments are of high order. She was honorary sec. of the Egyptian Exploration Fund, member of the Biblical Archæological Soc., member of the Soc. for the Promotion of Hellenic Studies, vice-pres. of the Bristol and W. of England National Soc. for Women's Suffrage, contributor of Egyptological articles to the new edition of the *Encyclopædia Britannica*, and author of *Recent Archæological Discoveries in Egypt*, in the American supplement to that work. She lectured in the U. S. 1889.

EDWARDS, BELA BATES, D.D.: 1802, July 4—1852, Apr. 20; b. Southampton, Mass.: Congl. minister; author and editor. He graduated at Amherst College 1824, was appointed tutor there 1826, and was asst. sec. of the American Education Soc. 1828–33. He edited the *American Quarterly Register* for the soc. 1828–42; founded the *American Quarterly Observer* 1833, and edited it after consolidation with the *Biblical Repository* 1835–38; and edited the *Bibliotheca Sacra* 1844–52. In 1837, he became prof.

of Hebrew at Andover Theol. Seminary; and 1848, prof. of Biblical literature there, and held the latter office till death. Besides his editorial labor comprised in 31 vols. 8vo. of the above publications, he published *Biography of Self-taught Men* (1831), *The Missionary Gazetteer* (1832), *Memoirs of Elias Cornelius* (1833), *Memoir of Henry Martyn*, a vol. on the Epistle to the Galatians, and an *Eclectic Reader*, and was associated with Profs. Felton, Park, and Sears, and Samuel H. Taylor, in the preparation of several works on German literature and grammar, and on classical studies. He received the degree D.D. from Dartmouth College 1844. He was as notable for modesty and Christian devoutness as for accurate scholarship and a singularly perfect English style.

EDWARDS, Clarence Ransom, American military officer: b. Cleveland, Ohio, 1860, Jan. 1. He was graduated at West Point in 1883; professor of military science and tactics at St. John's College, Fordham, 1890–3. Commissioned first lieutenant, 1891; captain, 1898; lieutenant-colonel of volunteers, 1899. Served on the staff of Gen. Lawton in the Philippines, and was recommended for brevets of major, lieutenant-colonel, and colonel in the regular establishment, and brigadier-general of volunteers. Accompanied Gen. Lawton's body to the United States. Chief of the division of insular affairs, War Department, 1900–2. Commissioned colonel, 1902, July 1, and chief of the bureau of insular affairs since that time and director of its publications.

EDWARDS, George Wharton, American artist and author: b. Fairhaven, Conn., 1859. He was educated in Antwerp and Paris, and has received many medals and honors for his work at American and European exhibitions. His watercolors are particularly praiseworthy and his magazine illustration is well-known and of a high quality. He has published *Thumbnail Sketches* (1886); *P'tit Matinic and Other Monotones* (1887); *The Rivalries of Long and Short Codiac* (1888); *Break o' Day, and Other Stories* (1889); he has illustrated Oliver Wendell Holmes' *Last Leaf* (1885); Austin Dobson's *Sun Dial* (1892); *Spenser's Epithalamion* (1895); *Old English Love-Songs* (1896); *Old English Ballads* (1897).

EDWARDS, Harry Stillwell, American journalist and novelist: b. Macon, Ga., 1854, April 23. He was graduated from the law department of Mercer University, and practised law, but in 1871 entered journalism in his native city. He is well-known as a writer of dialect stories. Among his works are: *Two Runaways, and Other Stories* (1889); *Sons and Fathers; The Marbeau Cousins; His Defense, and Other Stories.*

ED'WARDS, Henri Milne: see Milne-Edwards, Henri.

EDWARDS, James Thomas, American educator: b. Barnegat, N. J., 1838, Jan. 6. He was graduated at Wesleyan University in 1860. He served in the national

army in the Civil War, was afterwards principal of several schools, and in 1892–3 was field-secretary of the Chautauqua System of Education. He was a senator in the Rhode Island legislature, 1865–9, and a member of the New York legislature, 1892–3; was chairman of the committee on education of both bodies, and was the author of the University bill and Library and Traveling Library bills. He was a trustee and director of the departments of physics and chemistry of the Chautauqua summer schools 1883–93, and has been prominently identified with other educational movements. He has published *The Grass Family* (1872); *The Silva of Chautauqua Lake* (1892); *Addresses—Educational, Political, Scientific, Religious* (1896); *Pen and Picture* (1896); *Rhymes from a Reclining Chair* (1902); and has contributed articles to various periodicals.

ED'WARDS, Jonathan: celebrated American divine and metaphysician: 1703, Oct. 5—1757, Mar. 22; b. East Windsor, Conn.; son of the Rev. Timothy E. (q.v.) of East Windsor. He entered Yale College, 1716, took his degree B.A. in the following year, and in 1722 was licensed as a Congregational preacher of the gospel. Toward the close of 1723, he was appointed tutor in Yale College, an office which he filled with distinguished success. In 1726, he accepted an invitation to become colleague to his maternal grandfather, Mr. Stoddard, in the pastorate of the First Church (Congl.), at Northampton, Mass., and was ordained 1727, Feb. In the same year he married Sarah Pierrepont, daughter of the Rev. John Pierrepont, of New Haven. In Northampton, he labored with intense zeal for more than 23 years, at the end of which period he was dismissed by his congregation. The immediate cause of the rupture between him and his hearers, was his insisting that no 'unconverted' persons should be allowed to partake at the Lord's Table; but some years before, he had alienated many of the principal members of the church by denouncing certain improper and injurious practices which were tolerated in the community, and by attempting to make a public example of the offenders. Edwards was a powerful and impressive preacher, sombre in his religious opinions and sentiments, yet singularly pure and sweet in character and in thought, fervently devotional, earnest, unaffected, and nobly conscientious. He was eminently 'spiritually-minded'—indeed with such habitual vision of spiritual things as at times exalted his feelings to what would have been ecstasy except for the calm reasonableness and balance of his mind. During the famous 'Revival' of 1740–41, he was much sought after as a preacher, and is in fact often regarded as the originator of that movement. Certain it is that as early as 1734, a local manifestation of religious enthusiasm, involving many remarkable occurrences, had taken place in his own parish, of which he published an account entitled *A Faithful Narrative of the Surprising Work of God, in the Conversion of Many Hundred Souls in Northampton.* The quarrel between Ed-

wards and his congregation shows, however, that the 'revival' had not exercised an enduring influence on the community in general, since only a few years elapsed between the ecstasies of devotion and the outbreak of antagonism. After his dismissal in 1750, Edwards retired to a humble work as a missionary among the Indians of Massachusetts, near Stockbridge. While thus engaged, he composed his famous treatises on the *Freedom of the Will* and *Original Sin.* In 1757, he was chosen president of Princeton College, N. J., whither he proceeded 1758, Jan., but was cut off by smallpox only five weeks after his inauguration. Edwards will always be considered a master in dogmatic theology. Calvinism had probably never so powerful a defender. As a preacher, though without the graces of rhetoric, he had a lofty and sustained imagination, and deep sensibilities. As a writer, in the judgment of Robert Hall, 'he ranks with the brightest luminaries of the Christian Church, not excluding any country or any age since the apostolic.' His great characteristics are depth and comprehensiveness of argument; and were it not that the age for such discussions as Edwards engaged in is gone by, few philosophical writings would be more read than his, as certainly few would be more worthy of patient study than those of this illustrious divine. Besides the works already mentioned, Edwards wrote a *Treatise concerning Religious Affections*, the *History of Redemption*, a *Dissertation concerning the End for which God created the World*, and a *Dissertation concerning the True Nature of Christian Virtue.* The three last were posthumously published. A complete edition of Edwards' works was published by Dr. Timothy Dwight in 10 vols. (1809), and another at London 1817. A third was published 1840, with an essay by Henry Rogers, and memoir by Sereno E. Dwight. Students of his life and times usually feel the charm of his sincere and humble yet lofty soul; while those easily condemn him who either view him only from afar or test him by the standards of an age of compromises.

EDWARDS, Jonathan, d.d.: theologian and pres. of Union College; known as the Younger Edwards, or the Second President Edwards: 1745, May 26—1801, Aug. 1; b. Northampton, Mass.; second son of Jonathan Edwards, the distinguished metaphysician. His life was remarkably like that of his father in its main incidents. When six years of age he went with his parents to Stockbridge; his schoolmates were Indian children, and he learned their language so perfectly that it was the vehicle of his very thoughts. In his tenth year his father sent him to the Susquehanna river to learn the Oneida language with reference to a missionary life; he was there under the care of the Rev. Gideon Hawley. He was again in Stockbridge 1756-58, and four years at Princeton, graduating 1765. After a course of theology with Dr. Bellamy in Conn., and a tutorship at Princeton 1767-69, he was pastor

of the Congl. Church in White Haven (a part of New Haven, Conn.) for 26 years: this position he left for reasons similar to those that led to his father's dismissal from Northampton. He was pastor in Colebrook, Conn., two years, and became pres. of Union College 1799. He was a man of great ability, did much to elucidate his father's philosophy and the theology of the time, and published much, including masterly *Observations on the Language of the Muhhaneew Indians* (1788). His collected writings appeared in two vols. 1842.

EDWARDS, Julian, American composer: b. Manchester, England, 1855, Dec. 17. His opera, 'Victorian,' its libretto adapted from Longfellow's 'Spanish Student,' was produced in London in 1884. Since coming to New York in 1888 he has composed the operas: *Jupiter* (1892); *Friend Fritz* (1893); *King Rene's Daughter* (1893); *Madeline* (1894); *Brian Boru* (1896); *The Wedding Day* (1897), and various other music.

ED'WIN, English Saxon prince: d. 634; son of Ella, king of Northumbria (died about 589). Edwin succeeded to the throne at the age of three years, but a neighboring potentate, Ethelfrith, invaded and conquered his territories, whereupon the infant Edwin was carried into N. Wales, and was there educated. When he grew up to man's estate, Ethelfrith, learning that his power would not be secure so long as Edwin lived, forced him from his asylum, and for many years he wandered about a disguised fugitive. Reaching East Anglia, he claimed the protection of King Redwald, which was readily granted. While residing there, Ethelfrith sent messengers to Redwald, requiring him to deliver Edwin into his hands, and threatening war in the event of a refusal. Redwald promised to accede to the request. A friend made known the resolve to the prince, and counselled flight; to this Edwin would not consent, but sat down outside the palace, brooding over his misfortunes. While sitting there, Bede states that an unknown person approached him, and promised release from all his sufferings, if he would listen to what should be afterward taught him. The apparition then placed his hand upon his head, and, bidding him remember the interview and the sign, disappeared.

Redwald's queen pleaded the cause of Edwin and Redwald finally determined to protect him, raised an army, surprised Ethelfrith on the Idel, in Nottinghamshire, and defeated and slew him in 617. When Edwin regained his kingdom, he wooed Edilberga, daughter of Ethelbert of Kent. Her brother, who was a Christian, objected to her alliance with an idolater; but Edwin promised that he would not interfere with her religious belief. The princess became his wife; and Paulinus, who had been sent by Gregory to assist Augustine in his mission, accompanied her as her bishop.

About this time Edwin's life was attempted by an assassin, sent by the king of Wessex. He escaped with a slight wound, and on the same night the queen was de-

livered of a daughter. The king thanked his idols for the birth, but Paulinus directed his thankfulness to the Christian Savior. The king promised to accept the new faith, if heaven would grant him victory over the king of Wessex. His child and eleven of his household then received the rite of baptism. Raising an army, he defeated his foe, but delayed to fulfil his promise. Paulinus, having heard of the apparition which appeared to him while residing at the court of Redwald, one day entered the apartment in which Edwin sat, and placing his hand upon his head, asked him if he remembered the sign. The king was visibly affected, and at once assembled his Witenagemôte to deliberate on the matter of the new religion. Coifi, the high priest, spoke first, and intimated his willingness to desert the idols, and embrace the Christian faith. A thane next rose and pronounced the beautiful speech which has been versified by so many poets, but which is most effective in the simple serious Saxon of the Chroniclers. Coifi then headed the people in destroying the idol temple.

Edwin and the nobility of his kingdom were baptized in the eleventh year of his reign. Thereafter, he became the most powerful prince in England. He subdued a part of Wales, and his power extended n. to the Lothians. In 634, he fell in battle at Hatfield Chase, in Yorkshire; and in that disastrous fight, one of his children, and the greater portion of his army, perished. The history of this prince has been made the subject of a beautiful poem (*Edwin of Deira*, 1861) by Alexander Smith.

EE, n. *ē:* in *Scotch* and *prov. Eng.*, an eye. EEN, n. plu. *ēn*, the eyes.

EECKHOUT, *āk'howt*, GERBRAND VAN DEN: 1621, Aug. 19—1674, July 22; born in Amsterdam, Holland; painter. He studied painting with Rembrandt, and in the composition of his pictures, particularly his Biblical subjects, followed the style of his master closely, and imitated his color effects, though preserving a cooler tone. Among his works are *The Resurrection of the Daughter of Jairus*, now in the Berlin Museum; *The Presentation in the Temple*, in the Dresden Gallery; *The Woman taken in Adultery*, Amsterdam Gallery; *David and Abigail*, Schleissheim Gallery; and *Hannah giving Samuel to be Dedicated to the Lord*, in the Louvre. His strongest points were portraiture and expression. His portraits as well as his historical pictures abound in the best collections of Holland, while several of them are to be found in Germany.

EECLOO, *ā-klō':* town of Belgium, province of Eecloo, Flanders, on the high road between Ghent and Bruges, 12 m. n.w. from Ghent. It is clean and well built; and has manufactures of woolens, cottons, hats, tobacco, chocolate, soap, etc.; also breweries, distilleries, vinegar works, salt-refineries, dye-works, oil-mills, and a thriving trade in linen, cattle, and timber, as well as in grain, for which it has a large weekly market. Pop. (1900) 12,897.

EEL, n. *ēl* [Icel. *áll*, an eel: Dut., Dan., Ger. *aal:* Fin. *ilja*, slimy: Esthon. *illa*, slime, saliva; Skr. *ahi* a snake]: name popularly given to all serpent-shaped or worm-shaped fishes, and sometimes extended to other animals of similar form, but otherwise extremely different, as the *eels* in paste, in vinegar, etc. The fishes to which this name is most commonly applied are *malacopterous* fishes destitute of ventral fins, and having the body covered by a soft thick slimy skin, the scales very minute, and often almost invisible, or entirely lacking. Most of them were included in the Linnæan genus *Muræna*, and now constitute the family *Muræniдæ*, divided by some naturalists into the families *Synbranchidæ*, *Muræniдæ Anguillidæ*, *Congeridæ*, and *Ophisuridæ*. All these have the skeleton destitute of ribs, and the fin-rays not jointed; while the *Gymnotidæ*, including the electric eels, have ribs encompassing the belly, and the fin-rays jointed or branched. In all the eels, the gill-orifices are very small, and are situated far back, so that there is a long passage from the gill chamber outward; and hence, the gills not soon becoming dry, these fishes can remain out of water for a considerable time without injury, and some of them occasionally leave it of their own accord. The smallness of the gill-opening is also regarded as probably indicative of feebleness of respiration; and this, as in reptiles, is connected with extreme tenacity of life.—The *Synbranchidæ* have the gill-passages so united under a common integument, as to present externally only a single orifice. They are almost destitute of fins.—The species are few, and found only in tropical and sub-tropical seas.—The *Muræniдæ* also are generally destitute of fins, or nearly so; they all are destitute of scales.—The *Anguillidæ* have rather large pectoral fins, anal and dorsal fins extending to and encompassing the tip of the tail, and numerous longish scales imbedded in groups in the skin, so as to resemble lattice-work. To these the congers (q.v.), though marine, are very nearly allied. The *Ophisuridæ*, or snake-eels are more widely different, and are distinguished by the tail ending in a conical finless point.

American ichthyologists are disposed to accept the view that there is but one species of *Anguilla* belonging to the n. hemisphere, namely, *A. vulgaris*, or *A. anguilla*, if, by the rule of priority, Thunberg's generic name be combined with Linnæus's identical specific one. From its countless but intergrading variations, error has resulted in the naming of many forms as species, of which three are given in the figures herewith. It also varies much in color. *A. vulgaris* may therefore be said to occur on the w. coast of the Pacific; in and around Europe, except the Black Sea and the Danube and its tributaries; and on the shores and in the rivers of e. N. America, except in waters tributary to Hudson Bay. It is found throughout the Mississippi valley. Eels are taken in great numbers during winter by means of *eel-spears*, or

forks with several prongs, plunged into the mud. Sometimes they are digged out of the mud of river-banks, where large numbers are found congregating together The eels which descend to estuaries or to the sea deposit their spawn there, and countless multitudes of young eels ascend rivers in spring. So strong is the instinct which impels them, that they surmount obstacles apparently far more than sufficient to arrest their progress; they have been seen to ascend the large posts of floodgates, 'those which die, stick to the posts; others, which get a little higher, meet with the same fate, until at last a sufficient layer of them is formed to enable the rest to overcome the difficulty of the passage.' Young eels have also sometimes been met in large numbers performing migrations on land among moist grass, generally in the evening or during the night; but the purpose of these migrations is not understood, nor are they known to take place with regularity.

Eels are very averse to cold, and to this is ascribed their winter descent to brackish water, or hiding in mud. The number of known species is large, but all belong to the temperate and warmer regions of the globe. In these also, the marine fishes to which the name eel is sometimes extended, chiefly abound.

There are various means besides those already noticed employed for the capture of the eel. Weirs and stages are erected across rivers, and baskets, or *bucks*, as they are termed, fixed in them for the taking of the eels during their migrations. These baskets are of large size, and shaped like a huge Chinese jar, in the mouth of which is fitted a sort of funnel-shaped mouse-trap entrance, composed of flexible withy rods coming inward to a point, and through which the eels can easily force their way; but when they turn about to find the entrance again, it is closed against them. When the eels are running, as it is termed—that is, during their migrations—many hundredweights are often taken in these basket-traps in a single night. *Eel-pots* also are used for their capture. These are similar to the bucks, but smaller and more slender. They are sunk, in the most likely runs or narrow spaces between weeds, or close to banks, and through which eels are likely to run. Eels are caught also by means of night-lines. These are long lines with heavy weights at each end, and in the middle if necessary, with hooks tied on every yard. These hooks are baited with pieces of dead fish, minnows, or worms. The line is sunk, and laid across stream—or, if fishing for conger eels, in the sea—with, if it be thought necessary, a small buoy at one end, to recover the line by. These eel lines should be hauled as early in the morning as possible, or the best eels will be found to have worked themselves off, leaving a mass of knots and slime behind them to show where they have been. *Sniggling* is a favorite amusement with some anglers. A rod or a long stick is provided, bent round at the slender end like the top of a

very well used fishing rod; on the point is fixed a single ring; through this ring is passed a piece of string; one end of this is held in the fisherman's hand. To the other end, on some fine but strong cord, is fastened a stout darning-needle, tied to the cord by the middle. The needle is then baited, or thrust lengthwise into a large lob-worm, until the fine cord alone comes out of the head of the worm. The worm is then drawn up to the ring of the rod. The fisherman then seeks for some hole in which he thinks an eel may be, and applying the point of the rod, pushes the worm into it. As soon as the fisherman believes an eel has swallowed the bait, he gives a slight pull to the string; and the needle, which has gone down the eel's throat inside the worm perfectly straight, being tied by the middle, turns crosswise in the eel's throat or stomach, and hooks him. *Clod-fishing* is thus practised: a quantity of lob-worms are strung by means of a needle on some stout worsted until a considerable bunch of them is obtained; this is tied to the end of a cord, which is again tied to a stout pole. When the eels are on the move, the fisherman takes his station with a pail half-full of water within reach; he then drops his clod into the water, and allows it to sink to the bottom. As soon as he feels an eel tugging at it, he steadily and quickly, but without jerk, raises the bait from the water. The eel frequently has its teeth so entangled in the worsted as to be unable to let go, and thus is lifted from the water. The bait is held over the pail, a shake or two dislodges the eel.

EEL GRASS: see GRASSWRACK: TAPE-GRASS.

EEL-POUT: name given in parts of England to the burbot, and on the Scottish coast to the viviparous blenny; in N. America to the fam. *Lycodidæ;* example, the Mutton-fish or Mother of Eels, Congo or Lamper.

EELLS, MYRON, American Congregational clergyman: b. Walker's Prairie, Wash., 1843, Oct. 7. He was graduated at Pacific University, Ore., 1866, and at Hartford Theological Seminary 1871. He was pastor at Boise City, Idaho, 1872-74, later serving as missionary to the Indians at Skohomish, Wash., where he filled the pulpit of the Congl. church 1876. Among his works are: *History of Congregational Association of Washington and Oregon* (1881); *History of the Indian Missions on the Pacific Coast* (1882); *Ten years at Skohomish* (1886); *Father Eells* (1894).

EELS in paste, vinegar, fermenting and decaying substances, or stagnant water: minute worms belonging to the genus *Anguillula* of the order *Nematoidea* (q.v.). Their bodies are mostly cylindrical and transparent, so that one can easily see mouth, stomachs, and intestines of the creature. They multiply with extraordinary rapidity, so that in suitable places millions speedily swarm. Other Nematoids are the Ascaris (q.v.), Guinea-worm (q.v.), Trichina (q.v.) and see also ENTOZOA. Like other lower forms of life, these creatures may be dried, and will retain their vitality for months and even years. This is perhaps owing

largely to the thick chitinous cuticle which covers them externally, and is impervious to moisture. The eggs also are thick shelled, and do not easily lose their capability of development. The almost universal distribution of the group is explained by these facts. There are many species of *Anguillula*, some of which live in salt and fresh water, damp earth, etc.; the majority, however, live in putrefying animal and vegetable substances, while some few are parasitic; *Anguillula tritici* lives in ears of wheat, and gives rise to the disease known as ear-cockles (q.v.).

EERIE, or EERY, a. *ē′rĭ* [Scot. *eerie:* comp. Gael. *eire*, a burden]: serving to inspire fear; wild; affected with fear; ghastly. EERIESOME, a. *ēr′ĭ-sŭm*, causing fear by the supernatural.

EFAT: see SHOA: ABYSSINIA.

EFFACE, v. *ĕf-fās′* [F. *effacer*, to blot out—from L. *ex*, out; *facĭēs*, the face: F. *face*, a face]: to destroy or render illegible; to wear away; to strike or rub out; to destroy any impression on the mind. EFFA′CING, imp. EFFACED′, pp. *-fāst′*. EFFACE′ABLE, a. *-ă-bl*, capable of being rubbed out. EFFACE′MENT, n. act of effacing.—SYN. of 'efface': to obliterate; expunge; erase; cancel; destroy; delete; rub out; scratch out.

EFFARÉ, in Heraldry: see EFFRAYÉ (under EFFRAY).

EFFECT, n. *ĕf-fĕkt′* [OF. *effect*—from L. *effectus*, effected, made, finished—from *ex*, out; *făcĭō*, I make]: result or consequence of a cause or agent; consequence; result; in *art*, impression produced by certain combinations, as in a picture; especially the general impression produced on the mind by the first sight of a picture or other work of art, or the impression which it produces when seen from so great a distance as to render the details invisible. The term has reference both to design and coloring, both of which, if correctly indicated, may be judged with confidence before either has been completed in detail. Bold sketches of works are usually made beforehand by careful artists for the purpose of adjusting the composition and coloring to produce the desired effect: V. to produce; to bring to pass; to accomplish. EFFEC′TING, imp. EFFEC′TED, pp. EFFEC′TER, or EFFEC′TOR, *-tĕr*, n. one who. EFFEC′TIBLE, a. *-tĭ-bl*, that may be done. EFFEC′TIVE, a, *-tĭv*, having power to effect; producing effect; active; serviceable; operative: N. a soldier who is fit for duty. EFFEC′TIVELY, ad. *-lĭ*, powerfully; with real operation. EFFECT′LESS, a. EFFEC′TIVENESS, n. EFFECTS′, n. plu. goods; movables. EFFEC′TUAL, a. *-tū-ăl*, producing the effect intended or desired; efficacious; complete. EFFEC′TUALLY, ad. *-lĭ*. EFFEC′TUATE, v. *-āt* [mid. L. *effectŭātus*, effected: F. *effectuer*, to effect]: to bring to pass; to accomplish. EFFEC′TUATING, imp. EFFEC′TUATED, pp. IN EFFECT, really; virtually. FOR EFFECT, for show; to produce an impression only. OF NO EFFECT, without practical results; destitute of force or validity. TO GIVE EFFECT TO, to carry out or complete.—SYN. of 'effect, v.': to achieve;

execute; fulfil; realize, effectuate; complete; cause;—of 'effect, n.': production; event; impression; force; importance; purpose;—of 'effective': effectual; efficient; efficacious; forcible; energetic; active; powerful;—of 'effects': commodities; chattels; merchandise; wares; property; possession.

EFFECTIVE VALUE OF CURRENT. See ELECTRO-DYNAMICS.

EFFEIR, v. *ĕf-fēr'* [perhaps L. *effer'rĕ*, to carry out, to set forth]: in *Scot.*, to become; to fit; to fall to be paid as a fit proportion. EFFEIR'ING, imp. EFFEIRED, pp. *ĕf-fērd'*.

EFFEMINATE, a. *ĕf-fĕm'ĭ-nāt* [L. *effemĭnātus*, made womanish—from *ex*, *femĭna*, a woman: It. *effeminare*: F. *efféminer*]: soft and delicate as a woman; womanish; unmanly; weak: V. to make womanish; to unman; to soften. EFFEM'INATING, imp. EFFEM'INATED, pp. EFFEM'INATELY, ad. *-lĭ*. EFFEM'INATENESS, n. EFFEM'INACY, n. *-ĭ-nă-sĭ*, unmanly delicacy; womanish weakness; voluptuousness.—SYN. of 'effeminate, a.': womanly; tender; delicate; voluptuous; soft.

EFFENDI, n. *ĕf-fĕn'dĭ* [Turk. *éfendi*, sir: mod. Gr. *aphentēs*, a ruler]: title of honor among the Turks, bestowed upon civil dignitaries, men learned in the law, and persons of various ranks, in distinction from the title of Aga, borne by courtiers and military men. The word is equivalent to the English Sir, or the French Monsieur, and is frequently added to the name of an office. Thus, the sultan's first physician is termed *Hakim-effendi;* the priest in the seraglio, *Imam-effendi;* and the minister of foreign affairs, was formerly called *Reîs-effendi*.

EFFERENT, a. *ĕf'fĕr-ĕnt* [L. *effĕrĕn'tem*, bringing or carrying out—from *ef*, out of; *fero*, I bear or carry]: in *anat.*, conveying from or outward; carrying from the centre to the periphery: N. a vessel which carries outward, distinguished from *afferent*, which means 'conveying into or toward': a stream bearing away the water of a lake.

EFFERVESCE, v. *ĕf'fĕr-vĕs'* [L. *efferves'cĕrĕ*, to boil up or over—from *ex*, out; *fervērĕ*, to boil, to be hot]: to bubble up, as in boiling, or as the result of an acid uniting with a carbonate; to froth up, as in the fermenting of liquids. EF'FERVES'CING, imp.: ADJ. bubbling up. EF'FERVESCED', pp. *-vĕst'*. EF'FERVES'CENT, a. *-sĕnt* [F.—L.]: gently boiling or bubbling. EF'FERVES'CENCE, n. *-sĕns*, the frothing or bubbling up of liquids from the generation and escape of gas. EF'FERVES'CIBLE, a. *-sĭ-bl*, capable of producing effervescence. EFFERVESCING DRAUGHTS: see AËRATED WATERS.

EFFETE, a. *ĕf-fēt'* [L. *effētus*, barren, worn out—from *ex*, out; *fœtus*, the young of any creature]: worn out; barren; exhausted.

EFFICACIOUS, a. *ĕf'fĭ-kā'shŭs* [F. *efficace*, efficient—from L. *efficācem*, effectual, powerful—from *ex*, out; *făcĭō*,

I make or do]: producing the effect intended; effectual. EF′FICA′CIOUSLY, ad. *-lĭ*. EF′FICA′CIOUSNESS, n. *-nĕs*. EF′FICACY, n. *-kă-sĭ*, power to produce effects; virtue; power; ability.

EFFICIENT, a. *ĕf-fĭsh′ĕnt* [F. *efficient*—from L. *efficĭĕns* and *efficĭĕn′tem*]: producing effects; able; competent; material: N. that which produces effects; he that makes; a thoroughly trained and capable soldier. EFFICI′ENTLY, ad. *-lĭ*. EFFI′CIENCE, n. *-ĕns*, or EFFI′CIENCY, n. *-ĕn-sĭ*, a causing to be or exist; effectual agency; power of performing works.—SYN. of 'efficient, a.': effectual; effective; capable; efficacious.

EFFIERCE, v. *ĕf-fērs′* [L. *ef*, to make, and *fierce*]: in *OE.*, to make fierce; to enrage. EFFIER′CING, imp. EFFIERCED, pp. *ĕf-fērst′*.

EFFIGY, n. *ĕf′fĭ-jĭ* [It. and F. *effigie*—from L. *effigĭĕm*, an image—from *ex*, out; *fingo*, I form]: the image or likeness of a person, whether a full figure or in part, as on a coin; a portrait: see BRASS, MONUMENTAL (the word is hardly artistic). EFFIGIAL, a. *ĕf-fĭj′ĭ-ăl*, pertaining to, or having the character of, an effigy. TO BURN OR HANG IN EFFIGY [L. *in effigĭē*]: to burn or hang the image or figure of a person.

EFFLORESCE, v. *ĕf′flō-rĕs′* [L. *efflores′cĕrĕ*, to blow, or bloom, as a flower—from *ex*, out; *florem*, a flower]: to become covered with crystals, as the moisture frozen on a pane of glass; to form a mealy powder on the surface, as of a liquid; to become dusty on the surface; in *chem.*, to change from a compact or crystalline state to a powder, by losing water of crystallization, as common washing-soda when exposed to the air. EF′FLORES′CING, imp. EF′FLORESCED′, pp. *-rĕst′*. EF′FLORES′CENCE, n. *-rĕs′ĕns* [F.—L.]: the being in flower; bloom; redness of the skin. EF′FLORES′CENT, a. *-ĕnt* [F.—L.]: shooting out in flowers; forming a white powder on the surface; throwing out minute needle-like crystals.

EFFLORES′CENCE, a term applied to crystals, which, on exposure to the air, lose water of crystallization and crumble down into a powder. The most familiar instance is that presented by the glassy crystals of washing soda, which become white and pulverulent in the air. The same phenomenon is also presented by phosphate of sodium, borax, and other compounds. Another application of the word is to the fine white, feathery crystallization of sulphate and carbonate of sodium which appears on walls, or similar crystallizations on the surface of the earth, in decomposing rocks, etc.

EFFLUENT, a. *ĕf′flū-ĕnt* [L. *efflŭĕns* or *efflŭĕn′tem*, flowing or running out—from *ex*, out; *flŭĕns*, flowing: F. *effluent*]: flowing out: N. a stream which flows out of another stream, or out of a lake. EF′FLUENCE, n. *-ĕns*, that which flows from any body or substance.

EFFLUVIUM, n. *ĕf-flō′vĭ-ŭm*, EFFLU′VIA, n. plu. *-ă* [L. *efflŭvĭŭm*, a flowing out—from *ex*, out; *flŭō*, I flow]: the

invisible vapor or gas arising from putrefying matter or from diseased bodies; a disagreeable smell. EFFLUX, n. *ĕf′flŭks* [L. *effluxus*, flowed out]: that which flows out; a flowing out or issuing in a stream.

EFFORT, n. *ĕf′fŏrt* [F. *effort*—from L. *ex*, out; F. *force*, strength—from L. *fortis*, strong: mid. L. *fortĭă*, strength]: exertion; endeavor; strain of mind or body. EF′FORTLESS, a. without effort.—SYN. of 'effort': attempt; essay; endeavor; trial; exertion; experiment; struggle; strain.

EFFRAY, v. *ĕf-frā′* [F. *effrayer*, to frighten—from mid. L. *exfrigĭdārĕ*, to freeze with fright—from L. *frigĭdus*, cold]: in *OE.*, to frighten; to scare; to affray. EFFRAIDE, pp. *ĕf-frād′* in *OE.*, frightened; scared. EFFRAYÉ, *ā-frā-yā*, or EFFARÉ, *ā-fa-rā*, in *heraldry*, applied to an animal represented as rearing on its hind legs as if it were frightened or enraged.

EFFRONTERY, n. *ĕf-frŭn′tĕr-ĭ* [F. *effronterie*, impudence—from L. *ex*, out or forth; *frontem*, the forehead]: impudence; shameless boldness.—SYN.: boldness; assurance; audacity; hardihood; shamelessness; sauciness.

EFFULGE, v. *ĕf-fŭlj′* [L. *effulgens* or *effulgen′tem*, shining or gleaming forth—from *ex*, out; *fulgĕō*, I shine]: to shine with splendor. EFFUL′GING, imp. EFFULGED′, pp. *-fŭljd′*. EFFUL′GENT, a. *-jĕnt*, diffusing a flood of light; bright. EFFUL′GENCE, n. *-jēns*, great lustre or brightness; splendor. EFFUL′GENTLY, ad. *-lĭ*.

EFFUSE, v. *ĕf-fūz′* [L. *effūsus*, poured out or forth—from *ex*, out; *fūsus*, poured]: to pour out; to spill or shed, as a fluid. EFFU′SING, imp. EFFUSED′, pp. *-fūzd′*, poured out; shed. EFFUSION, n. *ĕf-fū′zhŭn* [F.—L.]: a shedding or spilling; act of pouring out; what is poured out. EFFU′SIVE, a. *-sĭv*, flowing abundantly; that pours out largely. EFFU′SIVELY, ad. *-lĭ*.

EFT, n. *ĕft* [AS. *efete*, an eft: Skr. *apada*, a reptile—from *a*, not; *pad*, a foot]: a small lizard; a newt— the two, notwithstanding important differences, having been till recently confounded even by naturalists. The Scotch word *ask* seems the exact equivalent of the English *eft*. In works of natural history, the term eft is now used as synonymous with NEWT (q.v.).

EGAN, *ē′gan*, PATRICK: 1841————; politician: b. Ballymahon, Longford co., Ireland. Going to Dublin, he found employment with a grain merchant there, and before he was 25 yrs. old was the head of a large house in the grain business. About 1865 he entered political life, and for 20 yrs. was one of the leaders of the popular party in Ireland. He was one of the founders of the Land League, and its treasurer till he fled to the United States to escape prosecution on the charge of treason-felony. He then engaged in business as dealer in grain in Lincoln, Neb. Egan was appointed by President Harrison U. S. minister to Chili 1889. In the civil war between the Chilian president, Balmaceda, and the

Chil'n congress, Egan saved the lives of a number of leaders on one or the other side by giving them asylum under the U. S. flag. On the downfall of Balmaceda and the demand that the fugitives should be delivered up, relations between the new govt. and Egan as U. S. minister were seriously strained. He resigned in 1893, and in the campaigns of 1896 and 1900 he abandoned the Republican party on the free-silver issue.

EGAN, Pierce: 1772–1849, Aug. 3; b. England, of Irish descent: sporting writer and humorist. He became famous as a journalist and sporting writer early in life. His chief humorous works were *Boxiana; Life in London, or, the Day and Night Scenes of Jerry Hawthorn and Corinthian Tom*, which was illustrated by George Cruikshank, and a companion vol., *Real Life in London*. His works were widely circulated.

EGBERT, *ēg-bert*, King of the West Saxons: most celebrated of the Anglo-Saxon kings before Alfred. He reigned 800–836, and was son of Ealmund, who is said to have reigned in Kent, descendant of the House of Cerdio. In 787, on the death of Cynegils, king of Wessex, Egbert laid claim to the throne, but had to give way to another claimant, Beorhtric who was more powerful. Egbert was compelled to flee, and took refuge at the court of Charlemagne. Here he remained 13 years, until, in 800, on the death of Beorhtric he was summoned to England to fill the throne of Wessex. England was at this time divided into three great sovereignties: Northumbria, extending over what were occasionally the separate kingdoms of Deira and Bernicia; Mercia, which had now subjugated the petty powers of Kent, Essex, and East Anglia; and Wessex, which had absorbed Sussex. For the first nine years of his reign, Egbert drew no sword. His mild government completed the attachment of his subjects, and the peace which he maintained fostered his strength. In 809, however, he marched against the Britons of the west, and after fighting five years in Cornwall and Devon, he succeeded in subduing the wild tribes to at least a temporary subjection. In 823, the most important event in his career took place. At that time a dispute had arisen between the East Angles and their Mercian conquerors, and the former sent ambassadors to Egbert imploring aid and protection, Egbert joined the East Angles with an army, which, according to the old chroniclers, had a peculiarly fighting appearance, being 'lean, meagre, pale, and long-breathed.' The encounter between the Mercians and the East Angles with their ally took place at Ellandûn (the modern Wilton, according to some), where a furious battle was fought, in which the Mercians were defeated with great slaughter. By this battle the power of Mercia was broken, and Essex and Kent, formerly Mercian provinces, became incorporated with Wessex. For four years after the great battle of Ellandûn, Mercia remained the seat of discontent and strife, and Egbert, in 827, taking advantage of his opportunity, led thither an in-

vading force, and reduced the country to vassalage. Turning next his arms against Northumbria, he compelled that sovereignty also to acknowledge his supremacy (827–828). He afterward penetrated into Wales, where, in like manner, success attended his arms.

Egbert, now virtually king of England, though both he and his successors until the time of Alfred were in the habit of designating themselves only kings of Wessex, found it necessary, after a few years' comparatively peaceful rule, to direct his attention to a new and foreign enemy. The Danes, who had been making frequent descents upon the island since 832, and who in that year had defeated the forces of Egbert, reappeared in 835 on the coast of Cornwall, where they were joined by numbers of the Cornish Britons. Egbert, however, at the head of his West Saxons, met them at Hengestes dûn (Hengstone), and in a great battle completely overthrew them. In the following year he died, after a reign of 37 years. In Egbert, ambition and prudence, bravery, talent, and courtesy were blended in such a manner as to form a monarch not unworthy to be the first king of England.

EGBERT, Harry C., American military officer: b. Pennsylvania, 1839, Jan. 3; d. 1899, March 4. He entered the army as first lieutenant in 1861 September; was promoted captain in 1865; major in 1890; and colonel in 1898, July 1. In October of the latter year he was commissioned brigadier-general of volunteers. When the war with Spain broke out he commanded the 6th Infantry, of which he was lieutenant-colonel. In the Santiago campaign, while leading a charge at El Caney, 1898, July 1, he was shot through the body. He had scarcely recovered from his wound when he applied for service in the Philippines. He arrived at Manila with his regiment 1899, March 4, and was killed while storming Malinta, on the 26th.

EGBERT, James Chidester, Roman archæologist and epigraphist: b. New York 1859. He was graduated at Columbia University in 1881, and held a prize fellowship (1882–85). He began to teach in the University in 1885 and was adjunct professor of Latin 1885–90. In 1890 he was appointed professor of Roman archæology and epigraphy in Columbia, and while he has done much to promote the study of these special subjects, and has published: *Introduction to the Study of Latin Inscriptions*, he has also edited *Cicero de Senectute;* and written *Macmillan's Shorter Latin Course.*

EGEDE, *ĕg'ĕh-dĕh*, Hans: 1681, Jan. 31–1758; b. in Norland, in Norway. He studied in Copenhagen, and was appointed to the church of Vaagen in Norway 1707. Having determined to proceed to Greenland to convert the natives, he resigned his cure at the end of ten years; and, after devoting himself with assiduity to the study of the language, embarked for Greenland, with his wife and sons, 1721. He remained 15 years in Greenland, during which

time he labored zealously among the people, and by his preaching and teaching secured a permanent footing there for the Christian mission, which owed its origin to him. On his return to Copenhagen, he employed himself in instructing missionaries in the dialects of Greenland; and in 1740 he was made a bishop. He has described the course and success of his labors in *Det gamle Grönland's nye Perlustration* (Copenh. 1729 and '41). He was ably seconded in his labors by his wife and his sons, Povel and Niels.—Povel E., who succeeded his father Hans in Greenland, and was also a bishop, translated the gospels and several devotional works into the Greenland language, and compiled a grammar and dictionary for the use of the Greenland mission; the latter appeared 1750 under the title *Dictionarium Grönlandico-danico-latinum.*

EGER, *ā'ghĕr:* river of Austria. It rises 12 m. n.w. of the town of Eger, flows first s.e. to e., then in a general n.e. direction, passing Elbogen, Saaz, Birdin, and Theresienstadt, near which town it joins the Elbe, after a course of about 120 m. Its current is rapid, and no part of its course is navigable.

EGER: town of Austria, province of Bohemia, on a rock on the right bank of the river Eger, 90 m. w. of Prague, near the Bohemian frontier. Formerly, it was a border fortress of some importance; its walls, however, have been almost entirely pulled down, and its fosses filled up with rubbish. Among the conspicuous edifices of Eger are its churches, of which there are four—one, the deanery church, very handsome; the market-place, within which is the large town hall; two monasteries, a Dominican and a Franciscan; and the barracks. East of the market-place is the house of the burgomaster in which Wallenstein was assassinated 1634. The ruins of the imperial burg or citadel, formerly the residence of kings and emperors, are in an angle of the fortifications above the river. From the midst of these ruins rises a singular square black tower, constructed of masses of volcanic tufa. The Double Chapel, consisting of two stories, the upper supported by graceful marble pillars, is a fine specimen of Gothic architecture. An avenue, nearly three m. long. leads from Eger to Franzenbrunn (q.v.). Eger has manufactures of broadcloth, kerseymeres, cottons, chintz, leather, soap, etc. Its industry and commerce have greatly increased since it became a point of junction of five railways. Pop. (1900), 23,665.

EGERAN, or Egerane: same as Vesuvianite.

EGERIA, *ē-jē'rĭ-â:* in legend, the Nymph or Camena from whom King Numa received the ritual of public worship which he established in Rome. The grove where Numa met the goddess to receive her instructions was dedicated by him to the Camenæ. Roman legends speak of two groves dedicated to Egeria—one near Africa, the other before the Porta Capena at Rome, where the grotto of Egeria is still shown.

EGERTON, Francis: see Bridgewater (Duke of).

EGERTON, Francis Henry: see Bridgewater (Earl of).

EGESTA, n. *ē-jĕs′tă* [L. *egestus*, voided or discharged—from *e*, out; *gĕrō*, I carry]: excrement; fæces; opposite of *ingesta*, the food taken in.

EGG, v. *ĕg* [Icel. *egg*, an edge; *eggia*, to sharpen, to incite (see Edge)]· to urge on; to incite. Eg′ging, imp. Egged, pp. *ĕgd*: see Agg.

EGG, *ĕg*, or Eigg, *ēg*: island 12 m. off the w. coast of Inverness-shire, 8 m. s.w. of the s. point of Skye; 4½ m. long by 2½ broad. It consists chiefly of trap, which in the n. alternates with sandstone and limestone, the latter rocks containing oolitic fossils, carbonized wood, and coal. The Scuir of Egg, in the s.w., rises 1,339 ft. The upper 470 ft. of this hill is a mass or vein of pitchstone, 1½ m. long, and 100 ft. broad. Some of the pitchstone forms straight, inclined, or curved columns, from a few inches to nearly two ft. in diameter. In one place, the pitchstone overlies red sandstone, conglomerate, trap, and the silicified wood of an oolitic pine. In the s. part of the isle is a large cave, entered by a narrow opening, through which only one person can creep at a time. Here it is traditionally related that the Laird of Macleod, to revenge an injury done to some of his clan, smoked to death all the inhabitants (200 Macdonalds) of the isle, who had hid themselves in the cave. Pop. 250.

EGG, n. *eg* [AS. *æg;* Icel. *egg;* Dan. *æg;* Ir. *ugh*, an egg. OE, *eye;* Ger. *ei*, an egg]: a roundish body produced by the female of birds and certain other animals, out of which a creature is produced of a like kind; the spawn of fishes, etc. Egg-apple, same as Egg-plant. Egg-bearer, n. in *bot.*, *Solanum ovigerum*. Egg-detector, n. an apparatus for showing the quality of eggs. They are placed upright in the holes in the lid of the dark chamber, and their transmitted light observed upon a mirror; their quality is determined by their translucence, as an egg becomes more cloudy and opaque as it becomes spoiled. Egg-flip, n. drink compounded of warmed ale, flavored with sugar, spice, spirit, and beaten eggs. Egg-glass, n. a glass for holding an egg while it is being eaten; a sand-glass running about three minutes, as a guide for egg-boiling. Egg-molding, n. in *arch.*, a peculiar molding in which a tongue dependent from the corona alternates with an oval boss whose major diameter is vertical, like an egg set on end. Egg, Mundane: see Mundane Egg. Egg-nog, n. a drink similar to egg-flip. Egg-sauce, n. sauce prepared with hard-boiled eggs, chopped up fine. Egg-slice, n. a kitchen utensil or slice for removing fried eggs from the pan. Egg-trot, n. slow jog-trot, such as one would adopt if carrying a basket of eggs. From the eggs to the apples, from first to last—in reference to the anc. Romans, who began their feasts with *eggs* and ended them with *apples*.—*Eggs* are usual products

in the process of reproduction in a great majority of the different kinds of animals; in other words, the animals are *oviparous*. It is only in the *Mammalia* that we find animals truly viviparous; while the *marsupial* quadrupeds and the *monotremata* form connecting links, in this part of their natural history, between the mammalia which are viviparous in the fullest sense of the term, and the warm-blooded animals (birds) which are oviparous.

The number of eggs varies extremely in different animals, some birds producing only one at a time, or in a year, others 20 or nearly that number, while the roe of the herring, cod, and many other fishes, contains myriads of eggs. The eggs of some animals are enveloped in a gelatinous mass; those of some are joined together, and are laid in a kind of string; those of others are connected together in various ways. For notice of such peculiarities, see the titles of different classes of animals.

The economical uses of eggs are well known. The eggs chiefly used are those of birds, though the eggs of turtles also are in great repute as an article of food and luxury, and those of fresh-water tortoises are valued for the oil which they yield. The birds' eggs used for food are chiefly those of the species commonly domesticated as poultry, and others allied to them—gallinaceous birds and web-footed birds. Of gallinaceous birds, the common domestic fowl, the turkey, the pea hen, and the guinea-fowl, produce the eggs most generally used and brought to market in different parts of the world; of web-footed birds, the common duck is in this respect the most important, though the eggs of other *Anatidæ* also are used for food, and those of some of the other web-footed marine-birds are much sought by the inhabitants of the wild and rocky shores which they frequent. Thus, the eggs of gulls and guillemots afford an important article of food to the people of St. Kilda, and of some of the Orkney and Shetland Islands, as well as to the inhabitants of Iceland and other far northern regions. It is in quest of eggs, as well as of young birds, that the dangers of the most tremendous precipices are braved by men whom their companions let down by ropes, and who gather the eggs from the rock ledges. The coasts of Labrador also are visited by *eggers*, who collect the eggs of sea-birds, and carry them for sale to some American ports. The eggs of some of the sea-birds of the W. Indies are of considerable commercial importance. See EGG-BIRD.

Chemistry of the Hen's Egg.—An ordinary good-sized hen's egg weighs about 1,000 grains, of which the white constitutes 600 grains, the yolk 300, and the shell 100. The white or glaire of the egg is a strong solution of albumen (q.v.) in water, and while readily miscible with water in its ordinary state, it becomes insoluble when subjected to heat, as in boiling an egg. In 100 parts, the white or glaire of egg consists of—water, 80; dry albumen, 15½; salts, etc., 4½. The yolk or yelk of the egg is composed of a strong solution of albumen, through which multitudes

of minute globules of oil are suspended, which render it essentially an emulsion. In 100 parts, it consists of—water, $53\frac{3}{4}$; dry albumen, $17\frac{1}{2}$; oil (with small proportion of salts), $28\frac{3}{4}$.

EGGA, *ĕg'gâ:* large town of w. Africa, Yaruba country, on the right bank of the Niger, lat. 8° 43′ n., long. 6° 20′ e. It is said to be two miles long. Its streets are narrow; the houses are principally huts built of clay, the walls smooth, and stained with indigo. Great quantities of narrow cotton cloth, only a few inches in breadth, and generally dyed blue, are manufactured here. The inhabitants are enterprising and commercial, many of them possess canoes, in which they trade up and down the Niger. These canoes are covered by a sort of shed, under which the traders sleep at night. The chief articles of trade are beautifully carved calabashes, cloth net-work, corn, yams, sweet potatoes, dried fish, and a few European articles, as beads and gunpowder. The population, from 10,000 to 15,000, is partly Mohammedan and partly pagan.

EGG ALBUMIN, see ALBUMINOIDS.

EG'GAR MOTH: name of certain species of moth, of the genus *Lasiocampa*, allied to the silk-worm moths. One species (*L. trifolii*), of a uniform foxy ochreous color, with wings expanding about two inches, produces a caterpillar as thick as a swan's quill, hairy, and ochreous brown, which feeds sometimes on broom, but frequently in clover fields.

EGG'-BIRD (*Hydrochelidon fuliginosum* or *Sterna fuliginosa*): bird of the gull family, called sometimes the SOOTY TERN. It is fully larger than the common tern of the n. U. S. shores; has a long, slender, nearly straight, compressed, sharp bill; very long, narrow, and pointed wings, and a long deeply forked tail; the general color is glossy black on the upper parts, except the forehead and the edges of the wings, which, with the under parts, are white. It abounds in the W. Indian seas, and is to be seen in myriads on and near some of the *keys* or low barren islets where it breeds. When visitors land on these keys, the disturbed birds rise and fly about in clouds which darken the air, while their turmoil overpowers even the roar of the breakers. The nest of the Egg-Bird is merely a little excavation in the sand, and usually contains three eggs, which are fully two inches long, of a pale-cream color, sparingly marked with light-brown and purple tints. The eggs are esteemed delicious, and form an object of profitable adventures in the months of March, April, and May, to the crews of numerous small vessels, fitted out from Kingston, Havana, and other W. Indian ports. Curious customs prevail among the egg-gatherers at the most frequented keys, and common consent has established a kind of code of laws among them. The eggs remain fresh and fit for use only a short time. With the eggs of the Egg-bird, those of the Noddy are also gathered,

and those of the Sandwich Tern and other allied species; and the name egg-bird, with some prefix, is sometimes extended in the W. Indies to several of the terns.

EGGLESTON, *ĕg'gĕlz-ton*, EDWARD, D.D.: author: b. Vevay, Ind., 1837, Dec. 10; d. 1902, Sept. 2. He was self-educated, became a circuit preacher of the Meth. Episc. Church 1856, and held several pastorates in Minn. till 1866, when he was appointed asst. editor of the juvenile paper *Little Corporal*, and removed to Evanston, Ill. In 1867 he went to Chicago, where he edited the *Sunday School Teacher*, and contributed to the New York *Independent* for 3 years, and then became literary editor of the latter. He succeeded Theodore Tilton as superintending editor of the *Independent*, was editor of *Hearth and Home* 1871-2, and pastor of the Church of Christian Endeavor (Congl.), Brooklyn, 1874-79, and subsequently applied himself to literature. He published *Mr. Blake's Walking Stick* (1869), *Book of Queer Stories* (1870), *The Hoosier School-master* (1871), *End of the World* (1872), *Mystery of Metropolisville* (1873), *The Circuit Rider* (1874), *Christ in Literature* (1875), *Christ in Art* (1875), *Roxy* (1878), *The Hoosier School-boy* (1883), *The Faith Doctor* (1891), *Duffels* (1893), *Tecumseh and the Shawnee Prophet* (1878), *Pocahontas and Powhatan* (1879), *Brant and Red Jacket* (1879), *Montezuma and the Conquest of Mexico* (1880), *A First Book in Amer. History* (1889), *The Story of Washington* (1893).

EGGLESTON, GEORGE CARY: author; b. Vevay, Ind., 1839, Nov. 26; brother of Edward Eggleston. He was educated at Ind. Asbury Univ. and Richmond (Va.) College, taught school, studied law and practiced in Va., served in the Confederate army through the civil war, was a reporter and editor on the Brooklyn *Union* 1870-1, succeeded his brother as editor of *Hearth and Home*, was literary editor of the New York *Evening Post* 1875-81, and became editor-in-chief of the New York *Commercial Advertiser* 1886, Jan. He has contributed frequently to magazine literature and published numerous books of which *A Rebel's Recollections* (1874), and the American edition of *Haydn's Dictionary of Dates* (1883) are best known. Other works are: *A Man of Honor* (1873), *How to Educate Yourself* (1872), *How to Make a Living* (1875), *The Wreck of the Red Bird* (1882), *Red Eagle, Juggernaut* (with Dolores Marbourg) (1891), *A Carolina Cavalier* (1901), *Dorothy South* (1902), *The Master of Warlock* (1903) *A Captain in the Ranks* (1904); *Evelyn Bird* (1904): *First of the Hoosiers* (1903); *Daughter of the South*, (1905); *Our First Century* (1905).

EGG-PLANT (*Solanum Melongena*): tender annual, cultivated for its fruit which grows in the form of an egg, two to five or more inches in diameter. It is one of the most difficult to raise of all our garden plants. In the Middle and Northern States the seed should be sown in a hot-bed about the middle of April. The first week in June is usually as early as it is safe to transplant. The

soil must be very rich. Plants should be set at least two and a half ft. apart. They should be shaded and watered for a few days and need careful cultivation during the summer. Mulching is beneficial both by retaining moisture in the soil and by keeping the fruit from the ground. The most formidable enemy is the Colorado potato beetle which must be fought during the entire season. There are several varieties yielding fruit of different colors and varying degrees of excellence. The New York Improved, a purple sort, and the Black Pekin are among the most desirable for market. In American cities and villages the fruit finds a ready sale as a delicacy, while in tropical countries it forms an important article of food.

EGG-TRADE: important branch of business in the United States and England. Although immense quantities of eggs are produced in the United States, the supply always falls very far short of the demand, and the deficiency is made up by importations from other countries. They are a staple article of trade and are regarded as good as cash at almost every country and village grocery. All not wanted for home consumption are sent to the large towns and cities, where, if in good condition, they always find ready sale. New York city alone uses not less than five hundred million eggs per year. They are forwarded in barrels, each of which holds 70 dozen. The price fluctuates greatly, being nearly twice as high in winter as in summer, due to the largely increased supply at the latter period. Very few eggs are sent abroad, but the number of those imported averages about two million dozen per year, and sometimes largely exceeds this sum. About three-fourths of the imported eggs come from Canada, but from two to three hundred thousand dozen per year are brought from China to the Pacific coast. The average annual consumption in this country is about nine dozen for each person. England also imports large quantities of eggs, most of which are obtained from France, though many are supplied by more distant countries. There are various processes for preserving eggs by the use of lime, salt, or chemicals, so that they will remain good for several months. When eggs are very plenty large numbers are preserved which are kept until prices rise.

EGHAM, *ĕg′am:* village in the n.w. of Surrey, Eng., on the right bank of the Thames, 18 m. w. of London. In the vicinity is Runnymede, a meadow on the Thames, where King John conferred with his barons before signing the Magna Charta 1215. Near also is Cooper's Hill, rendered famous by Denham and Pope. Pop. (1900) 11,894.

EGINA: see ÆGINA.

EGINHARD, *ĕg′ĭn-hârd*, or EINHARD, *īn′hârt:* biographer of Charlemagne: born toward the end of the reign of Pipin, or the beginning of that of Charlemagne; d. 840, Mar. 14. At an early age, he repaired to the court of the latter monarch, and became a pupil of Alcuin. His talents and acquirements gained him the favor of the emperor,

who appointed him his private secretary, and superintendent of public buildings. Eginhard accompanied the emperor in all his marches and journeys, never separating from him except on one occasion, when he was dispatched by Charlemagne on a mission to Pope Leo. On the death of the emperor, he was appointed preceptor to Lothaire, son of Louis le Débonnaire, and for a number of years afterward appears to have been lay abbot of various monasteries; but ultimately becoming tired of secular life, he retired to the secluded town of Mühlheim. Here he erected a monastery, and changed the name of the place from Mühlheim to Seligenstadt (City of the Blessed). He is said to have now become a monk, but this is scarcely authenticated. Eginhard was buried beside his wife who died 836, and the two coffins are now shown in the chapel of the castle at Erbach. The counts of Erbach trace their descent from Eginhard. His *Vita Caroli Magni*, completed about 820, with respect to plan and execution, as well as language and style, is incontestably the most important historical work of a biographical character that has come down to us from the middle ages. It was frequently used as a school-book, and was therefore copied *ad infinitum*. The best German edition is that of Pertz, in the *Monumenta Germaniæ Historica*. His *Epistolæ*, 62 in number, also are of considerable value in a historical point of view. The French consider the edition of Eginhard's works by M. Teulet, with a translation, and life of Eginhard (1848), to be the best and most complete. Eginhard's second work, the *Annales Regum Francorum, Pippini, Caroli Magni, Hludowici Imperatoris*, embraces the period 741 to 829. According to a pretty legend, Eginhard's wife, Emma was a daughter of Charlemagne. A mutual affection had arisen between them, and on one occasion when the lovers were enjoying a nightly interview, a sudden fall of snow covered the spacious court, thus rendering retreat impossible without leading to a discovery. As the traces of female footsteps could not excite suspicion, Emma carried her lover across the court on her shoulders. This scene, it is said, was observed from a window by Charlemagne, who united the affectionate pair in marriage. On this legend Fouqué founded his romance of *Eginhard and Emma*, and Longfellow has made it the subject of a short poem.

EGLANTINE, n. *ĕg'lăn-tīn* [OF. *aiglantine;* F. *églantier*, the dog rose—from *aiglent*, a thorn—from mid. L. *aculen'tus*, prickly: Prov. *aguilen*, a hawthorn]: a plant covered with *aiglents* or thorns; the OE. name for the sweet brier; applied sometimes to other of the smaller flowered species of rose; used for 'columbine' or 'honeysuckle' in Milton.

EGLINTON, *ĕg'lĭn-ton*, AND WINTON, *wĭn'ton*, ARCHIBALD WILLIAM MONTGOMERIE, Earl of, K. T.: 1812-61; b. Palermo: twice lord-lieut. of Ireland. He was a well-known patron of the turf and field sports, and his name is particularly associated with a splendid revival of the

mediæval tournament, which he gave at Eglinton Castle 1839 (see TOURNAMENT). Lord Eglinton was at various times lord-lieut. and sheriff-principal of Ayrshire, lord rector, and dean of the faculty of Glasgow Univ., etc.

EGMONT, *ĕg-mōng'*, LAMORAL, Count, Prince of GAVRE: 1522–1568, June 4; b. in the castle of La Hamaide, in Hainault. He inherited his property and titles from his elder brother Charles. He accompanied Charles V. on his expedition against Algiers 1541, and followed that monarch afterward in all his campaigns, but without distinguishing himself greatly. After the accession of Philip to the throne Egmont commanded, with great success, the cavalry, in the battle of St. Quentin 1557, and next year in that of Gravelines; and when Philip finally returned to Spain, he left Egmont gov. of Flanders and Artois. In this position, Egmont entered into alliance with the party in the Netherlands that were dissatisfied with the Rom. Cath. policy of Philip, and from a courtier became all at once a man of the people. His proud, imperious character, however, and his subsequent conduct, have induced many to suppose that, like his bosom-friend the Prince of Orange, he was actuated in this less by high motives than by self-interest, or at least by disappointed ambition. The more common opinion, however, is, that he was a humane and virtuous patriot, who, though indifferent to Protestanism as a religion, was anxious to do justice to all the members of that oppressed faith. When Margaret, Duchess of Parma, against the will of the Prot. party, was made regent-gen. of the Netherlands, Egmont and the Prince of Orange entered the council of state, and held the command of the few Spanish troops. At first he sided with the party who were discontented with the infringement of the liberties of the provinces, and the introduction of the inquisition; but when insurrections broke out, he at last broke with the Prince of Orange and the 'Beggars' League,' as it was called. He seemed to have restored order, and to be maintaining it, when 1567, Apr., the Duke of Alba was sent as lieut.gen. to the Netherlands. The Prince of Orange and other chiefs of the insurrection left the country; Egmont, wishing to save his private property, remained, thinking his return to the court had secured his safety. When Alba entered Brussels, Aug 22, Egmont went to meet him, and sought to secure his favor by presents. He appeared to have gained his confidence, when suddenly after a sitting of the council, he and Count Hoorn were treacherously seized and carried to the citadel of Ghent. The states of Brabant sought to withdraw Egmont from the bloody tribunal, as it was called, instituted by Alba, and Egmont, as a knight of the Golden Fleece, denied its competency. But all in vain. He was called upon to justify himself against 90 counts of accusation; and as he persisted in protesting against the incompetency of the court, and thus left many of the points unanswered, he was held guilty of contumacy, and along with Count Hoorn condemned to death. On the following

day, 1568, June 4, they both were beheaded in the market-place of Brussels. Although Egmont hoped for pardon to the last, and intercession was made for him from the highest quarters, he died with the greatest composure. It is related that as he received the fatal stroke, Johanna Lavil, who had been his mistress, fell down dead, and the people, in a paroxysm of sympathy, dipped handkerchiefs in the blood that seemed shed in martyrdom to freedom. Egmont left 11 legitimate children, of whom three were sons. The whole of his property, movable and immovable, was confiscated with the greatest rigor. See *Correspondance de Marguerite d'Autriche, Duchesse de Parma* (Bruss. 1842), and *Correspondance de Philippe II. sur les Affaires des Pays-Bas* (Bruss. 1848–51, 2 vols). Goethe has made the death of Egmont the subject of a tragedy.

EGMONT, *ĕg'mŏnt*, MOUNT: active volcano of New Zealand, on the northerly island of its own group, rising 8,340 ft. above the sea. It is 18 m. s. of New Plymouth; lat. 39° 15′ s., long. 174° 13′ east.

EGMONT, PORT: principal harbor of the Falkland Isles, on the n. coast of the more westerly of the principal two islands of the group, its seaward barriers being the islets of Keppel and Saunders. It is in lat. 51° 21′ s., and long. 60° w. The anchorage is good; and the shores afford fresh water, but are almost destitute of wood. Several other unimportant places have the name Egmont.

EGO, n. *ē'gō* [L. *ego*, meaning I: Ger. *ich;* Dan. *jeg;* Sw. *jag;* AS. *ic*, I]: the thinking subject, whatever it may be—all beyond being *non-ego*. EGOISM, n. *ē'gō-ĭzm*, (1) The attitude of having as one's conscious end the advantage of one's personal self (psychological). (2) The theory that the standard of right and wrong is whether action promotes or injures the interest or pleasure of the person who performs it (ethical). E'GOIST, n. (1) One who has the attitude of egoism (1); (2) one who holds the theory of egoism (2). EGOTISM, n. *ĕg'ō-tĭzm*, a speaking, writing, or thinking much of one's self. EG'OTIST, n. one who writes or speaks much of himself. EG'OTIZE, v. *-tīz*, to exalt one's self. EG'OTI'ZING, imp. EG'OTIZED, pp. *-tīzd*. EG'OTIS'TIC, a. *-tĭs'tĭk*, or EG'OTIS'TICAL, a. *-tĭ-kăl*, given to egotism; self-conceited. EG'OTIS'TICALLY, ad. *-lĭ*.—SYN. of 'egotistical: opinionated; selfish; conceited; vain; self-important.

EGRANULOSE, a, *ē-grăn'ū-lōs* [L. *e*, without, and Eng. *granules*]: in *bot.*, without granules.

EGREGIOUS, a. *ē-grē'jĭ-ŭs* [L. *egrĕgĭŭs*, singular, notable—from *ex*, out of; *grĕgem*, a flock]: unusual; remarkable; distinguished, in a bad sense; enormous. EGRE'GIOUSLY, ad. *-lĭ*. EGRE'GIOUSNESS, n. the state of being remarkable and unusual.—SYN. of 'egregious': monstrous; extraordinary; distinguished.

EGRESS, n. *ē'grĕs* [L. *egressus*, a departure—from *ex*, out of; *gressus*, a step, a course: It. *egresso*]: a going out;

power or act of going out; departure. EGRES'SION, n. *-grĕsh'ŭn*, the act of going out.

EGRET, n. *ē'grĕt* [F. *aigrette*]: a small white heron; name often given to various species (usually smaller white species) of heron (q.v.), particularly those which, at least during the breeding season, have the feathers on the lower part of the back lengthened and their barbs loose, so that this part of the plumage is very soft and flowing. Most of the egrets have beautiful white plumage. The distinction between egrets and other herons is not strongly marked, and the names are often used indiscriminately, though the name egret is never given to the common heron. Egret plumes are used for ornamental purposes, particularly the occipital crest and scapulars of the LITTLE EGRET (*Ardea garzetta*); and the name egret (Fr. *aigrette*) has become a common term for a tuft of feathers, though it is said to be derived from the French *aigre*, harsh, on account of the harshness of the bird's voice. The American egret (*Ardea egretta*) has the plumage white, or partly of a creamy color. The bird is found breeding from Florida to New York, and along the shores of the Mexican Gulf to Texas, but ranges much beyond these limits at other seasons. Its food consists of the smaller quadrupeds, small fishes, frogs, lizards, snakes, and insects, and it breeds like other herons. The long silky filaments of the back are hardly to be seen, except about the love season, which varies from early spring to midsummer according to climate; both sexes possess this train, and many are shot to obtain these feathers for ornamental purposes. The little white egret or snowy heron of America (*A. candidissima*) is much smaller and has a crest on the head which the large species lacks. In habits and distribution it is similar. The European egret (*A. alba*) is about 40 inches long, of a pure white plumage. It is common in southern Europe, but comparatively rare in the northern and central parts. The little egret (*A. garzetta*) is about 22 inches long from bill to end of tail; the plumage is white; from the hinder part of the head spring two narrow feathers four inches long. This species is most abundant in southern Europe and northern Africa; it occasionally wanders as far as England. The Louisiana heron (*A. tricolor*) and the reddish egret (*A rufescens*) are often given the name, but the latter is white in winter only, and the former is partly colored at all seasons. Both are maritime birds, chiefly of the Gulf States.

EGRIOT, n. *ē'grĭ-ŏt* [F. *aigret*—from *aigre*, sour—from L. *acrem*, sour]: a species of sour cherry; the wild cherry.

EGUZQUIZA, *ā-gôth-kē'thâ*, ROGLIODE, Spanish painter: b. Santander 1835. He studied at the Ecole des Beaux Arts, Paris. Among his works are: *Virgin with Rosary* (1859); *Discussion Between Don Quixote and the Cure; Michelangelo Beside the Body of Vittoria Colonna; Charles V. at Convent of St. Juste* (1868), reproduced in popular engraving; *Family Concert; Master-at-Arms; Portrait of Lady* (1878).

NORTHEAST AFRICA.
SCALE OF STATUTE MILES.
0 100 200 300
Copyright, 1904, by Rand, McNally & Co.
Longitude East from Greenwich.
MEDITERRANEAN SEA
MOUTHS OF THE NILE
GULF OF SIDRA (Syrtis Major)
BARCA
TRIPOLI
FEZZAN
MOORZOOK
LIBYAN DESERT
EGYPT
LOWER
UPPER
CAIRO
ALEXANDRIA
Damietta
Port Said
Jerusalem
ARABIAN MTS.
Plateau of the Libyan Desert 500 to 600 feet
Oasis of Siwah (Jupiter Amon)
Oasis of Bahrieh (Little Oasis)
Oasis of Farafrah
Oasis of Dachel (Great Oasis)
Oasis of Kufarah
Oasis of Jalo
First Cataract
Second Cataract
Third Cataract
Fourth Cataract
Fifth Cataract
Sixth Cataract
TROPIC OF CANCER
DESERT
NUBIAN DESERT
Wady Halfa
Bayuda Desert
TIBESTI OR TU
TEBU OR TEDA
WAYANGA
ENNEDI
KANEM
WADAY
DAR FOOR
el Fasher
KORDOFAN
EGYPTIAN SOUDAN
KHARTUM
Omdurman
Berber
Suakin
Kassala
Atbara
Bahr el Abiad (White Nile)
Bahr el Azrek
Blue Nile
Fashoda
BAGARA
DAR NUBA
DAR FERTIT
BONGO
JANGEH
DOR
DAR BANDA
ABYSSINIA
AMHARA
Gondar
Addis Abbeba
ABBA JARED MT. 14,714 ft.
RAS DASHAN 15,160 ft.
ERITREA
Massaua
DAHLAK ARCHIPELAGO
KAFFA
GALLA
SOMALI
SINGALI MTS.
MIDJERTAIN
Berbera
Harar
OGADEN
Obock
Tajoora (FRENCH)
Zeyla
Strait of Bab-el-Mandeb
G. OF ADEN
Aden (Br.)
Ras Afula
RED SEA
ARABIA
HEJAZ
Medina
Mecca
YEMEN
HADRAMAUT
R., MC N. & CO., ENGR'S, CHI.

EGYPT.

EGYPT, *ē′jĭpt:* country in n.e. Africa, extending from the Mediterranean to the first cataract of the Nile, at Assouan, from lat. 24° 6′ to 31° 36′ n. The name is derived from the Greek *Aigyptos*, either meaning the Coptic land, or as some maintain, derived from *Hakaptah*, 'the city of Ptah,' i.e., Memphis (according to Maspéro). In Hieroglyphs and Coptic, it was called *Kemi* (Black Land), from the color of the soil; and by the Hebrews *Mazor* or *Mizraim*, modified by the Assyrians into *Musr*, and by the Persians into *Mudraya*. The country may be described as the bed of the Nile, the cultivated territory extending only to the limits of the inundation. This river runs from the cataracts of Assouan, in a northerly direction, to Denderah, where there is one great bend to the w.; and a few m. n. of Cairo (lat. 30° 15′ n.), the river divides into two main streams, forming the Rosetta and Damietta branches. The other five mouths, which existed in antiquity, have silted up; the alluvial district inclosed by these mouths, and supposed by the ancients to have been gained from the sea, formed the ancient Delta. The basin of the Nile is formed by the ranges of the Arabian hills on the e., and the Libyan on the w. side. The rate of deposit of mud is supposed to be about 4½ inches in a century. The e. chain of mountains rises to about 1,000 ft. above the level of the sea. The great physical peculiarity of Egypt is the absence of rain, the land being irrigated only by the annual overflow of the Nile. The climate is remarkably mild and sound, especially s. of the Delta; and in the desert, from Cairo to Alexandria, the air contains more moisture than to the south. From the middle of Aug. to Dec., w. winds prevail; e. winds from Dec. to Mar.; after that, unhealthful s. winds or Khamsin till June; and from June to Aug. the n. or Etesian winds. Earthquakes are occasionally felt; and the temperature varies from 84° F. to 32°. The most remarkable phenomenon is, however, the regular increase of the Nile, fed by the fall of the tropical rains, which commence in 11° n. lat., in the spring; and falling first into the White, and then Blue Nile, reach Egypt in the middle, and the Delta in the end of June. In the middle of July, the red water appears, and the rise may be dated from that time; it attains its maximum at the end of Sep., and begins to decline visibly in the middle of Oct., and subsides to its minimum in April. At the end of Nov., the irrigated land has dried, and is sown, and is covered with green crops, which last till the end of February. In March is the harvest. The state of the Nile, in fact, marks the season more accurately than the variation of temperature. Egypt is not remarkably healthy, as, in addition to the visitations of plague and cholera, ophthalmia, diarrhœa, dysentery, and boils often prevail, and European, and even Nigritic races cannot be acclimatized.

Geology.—Egypt is separated from Nubia by a low hilly region about 50 m. broad from n. to s., composed of granitic rocks. The same crystalline rocks extend up the shore of the Red Sea to near the opening of the Gulf of

Suez, stretching inland for fully 30 m. The scenery in this district is wild and rude, and the course of the Nile is frequently interrupted by cliffs and broken masses of granite, forming magnificent cataracts. The granitic region terminates at Assouan, the ancient Syene. From the rocks here were obtained the materials for the colossal and monolithic monuments of Egypt. The valley of Upper Egypt is bounded by two ranges of hills running northward—the Arabian range on the right, the Libyan on the left of the river, both alike composed of cretaceous strata, the predominant rock being sandstone. This is a durable and easily worked stone, and was consequently extensively used in the erection of ancient temples. The city of Thebes was built of it. The cretaceous sandstone extends from the granitic rocks forming the first cataract at Assouan for about 85 m. to Esné, where it is covered by a limestone belonging to the upper chalk series. This continues on both sides of the valley for about 130 m., when it is covered by a tertiary mummulite limestone, which forms the farther prolongation northward of both ranges of hills. Because of the easy disintegration of these beds, the scenery in the limestone districts is tame and monotonous; frequent tablelands occur, on one of which are built the three pyramids of Gizeh, the material employed being the predominant limestone.

Over a large extent of Egypt, these rocks are covered with moving desert sands, and in the flat lands bordering the Nile, with the alluvium brought down by its waters, and which has formed the Delta at its mouth. This alluvium consists of an argillaceous earth or loam, more or less mixed with sand, and a quartzose sand probably derived from the adjacent deserts by violent winds. It is remarkable that this sedimentary deposit has no traces of stratification, and also that within short distances, great varieties are observed in what are apparently synchronous deposits. In late years more careful observation of the Nile deposits, with the striking conclusions that have been deduced therefrom, have drawn increased attention of geologists to these deposits. See MEMPHIS.

Natural History and Productions.—The fertile valley of the Nile and the desert regions which inclose it, are very different, not only in their botany, but in their zoology. One of the most notable of Egyptian quadrupeds is the hippopotamus, which formerly reached the Delta, but is now seen only in the more southern parts of the Nile. The giraffe is occasionally found within the southern borders of Egypt. The jackal and hyæna are common; also the ichneumon (q.v), so much celebrated among the ancients; and the jerboa. The one-humped camel was introduced by the Ptolemies for the transit of the Indian trade. The other usual domestic quadrupeds have existed from most ancient times. Of domestic birds, water-fowl were anciently most numerous; the gallinaceous poultry now common not being probably of older date than the Persian invasion. Pigeons have always been abundant. The

TEMPLE AT DENDERAH, EGYPT.

Egyptian vulture (q.v.) is a common and notable bird, as is also the ibis (q.v.), held sacred by the ancient Egyptians, and of which many fables have been related. The ostrich sometimes occurs in the desert. Of reptiles, the most famous is the crocodile of the Nile; monitors (q.v.) are also abundant, saurian reptiles of considerable size. Smaller lizards abound. The trionyx, or soft tortoise, is plentiful in the Nile. Serpents are numerous; among the most venomous and dreaded of which are the asp (q.v.) or haje, and the cerastes (q.v.). Egypt abounds in fish, the most remarkable being the binny (see BARBEL), the *Latus* (one of the perch family), the Bayad or *Silurus*, the *Chromis Nilotica*, and the *Mormyrus oxyrhynchus*. The sacred beetle (*Scarabæus sacer*) is one of the most remarkable insects. Locusts are a dreaded pest. Egypt is still notable also for the abundance of the other creatures mentioned by Moses as its plagues.—Many of the European trees and plants are found in Egypt; the date-palm, the doom-palm, the sycamore, acacias, tamarisks, etc., are among its more peculiar botanical productions; also the papyrus (*p-apu*), which anciently supplied material for paper, and the lotus(*shnin*) or water-lily of the Nile. The extensive culture of papyrus has been, in modern times, replaced by that of the sugar-cane, cotton, indigo, and tobacco; and the papyrus has almost disappeared. Gourds and melons have always abounded. To the wheat and barley of antiquity have been added maize and durra. Egypt is very deficient in timber trees; the Pharaohs obtained cedar from Lebanon and ebony from Ethiopia. The rocks of Egypt afforded the stones used in its edifices and sculptures; granite, syenite, basalt (at Assouan), breccia (in the Cosseir Rood), porphyry (from the quarries of Gebel Doshan, opened in the reign of the emperor Claudius), sandstone, and limestone. Alabaster (found at Tel-el-amarna) has been used from the earliest periods to the present day. Emeralds are produced by the mines of Gebel Zabara; salt, natron, and—since 1850—sulphur are among mineral productions of Egypt.

Divisions.—The country was anciently divided into 44 nomes—22 in Upper, and 22 in Lower Egypt. Each nome or dept. had a separate local municipal government of a nomarch or lieut-gov., *ha*, besides governors of the cities, of the temples, scribes, judges, and other functionaries. Their limits were measured and defined by landmarks. This division, as old as the 4th dynasty, varied in number at different times. Under Sethos I. or Sesostris, there were 36 nomes—10 in the Thebaid, 10 in the Delta, and 16 in Middle Egypt. At the time of the geographer, Ptolemy, there were 47—the Antinoits having been added. The country beyond the cataracts to Hierosycaminos was named at the Roman period Dodekaskoinos. In A.D. 400 Egypt was divided into Augusta Prima and Secunda on the e., and Ægyptiaca on the w., the Heptanomis as far as Oxyrhynchus was named Arabia, then Thebais Proxima as far as Panopolis, and

Thebais Supra to Philæ. Under the Arabs, Egypt has been divided into Masr-el-Bahri or the Delta; the Faioum, El Bostani, or Middle Egypt; and Es Said or Upper Egypt, Nubia, Darfur, and extensive territories on the Upper Nile, extending to the Victoria Nyanza in central Africa, were 1876–82, subject to the khedive. See SUDAN.

For a description of the most remarkable antiquities of Egypt, see ABOUSAMBUL: ALEXANDRIA: EDFOU: MEMPHIS: THEBES: also NILOMETER: OBELISK: PYRAMID: etc.

The *population* of the country must have been large at the earliest period, as 100,000 men were employed in the construction of the Great Pyramid alone during the 4th dynasty. It has been placed at 7,000,000 under the Pharaohs, distributed in 1,800 towns, which had increased to 2,000 under Amasis, B.C. 525, and upward of 3,000 under the Ptolemies. In the reign of Nero, it amounted to 7,800,000. The pop. (1844) was 2,500,000; (1859) 5,125,000; and (1879) including Nubia, Darfur, and other dependencies, nearly 17,000,000, of whom 5,200,000 inhabited Egypt proper. The great bulk of the inhabitants consist of native Mohammedans; the Copts (q.v.) are estimated at 150,000, and the rest are composed of Bedouin Arabs, Negroes, Abyssinians, Turks, Syrians, Greeks, Armenians, Jews, and Western Europeans. The original population appears, both from the language and from the physical conformation of the mummies, to have been of Asiatic origin, afterward blended with Ethiopian by subsequent irruptions and conquests; but there appears to have been an aboriginal race at an early period, of copper color, fair proportioned, though with rather thin legs, large feet, rather high cheek-bones, and large lips. According to Herodotus, Diodorus, and Plato, the system of castes prevailed in Egypt. The first of these authors says there were seven castes—of priests, warriors, cowherds, swineherds, innkeepers, interpreters, and pilots. Diodorus makes only five—priests, soldiers, cultivators, shepherds, and artisans; and Plato the same. The evidence of the monuments, however, shows that these were rather conditions of society than castes, as the different orders not only intermarried, but even, as in the case of priests and soldiers, held both employments. As in all bureaucracies, the sons often obtained the same employments as their fathers.

Religion.—The Egyptian religion was a philosophical pantheism, the various attributes of the Deity being divided among the different gods of the Pantheon. Unlike the Greek, where a god was honored in a separate temple, each Egyptian divinity was accompanied by a *put* or 'company' of companion-gods. The principal nomes and cities had each a family group of gods, consisting of a parent deity, a wife and sister, and a son. Thus Ptah or Hephæstus, the eponymous and principal god of Memphis, formed a triad with the goddess Sekhet (fig. 1), or Bast, and Imhotep; at Thebes the triad was Amen-ra, Mut, and Khons; and at Apollinopolis Magna, Harbahud (Horus)

Hathoe, and Har-pakhrut (Harpocrates). These triads were often accompanied by inferior deities; and personifications of the elements, passions, and senses, and feelings were introduced. The worship of some triads, however, became universal—that of Osiris, Isis, and Horus being found all over Egypt at the earliest period. The gods, indeed, are stated by the Greeks to have been divided into three or more orders. The first contained seven (or nine); the second, twelve; the third, an unknown number. The gods of the first order were Ptah, Ra, Shu, Seb, Osiris, Set or Typhon, and Horus, according to the Memphite; and Amen, Mentu, Atum, Shu, Seb, Osiris, Set, Horus, and Sebak, according to the Theban version. Great uncertainty prevails about the gods of the second and third order, and still greater difficulty about the genesis and nature of the gods, different doctrines prevailing at different times and places; and the tendency to fuse different gods into one, particularly at a later period: Amen Ra, for example, being identified with Horus; and Horus, Ra, Chnum, Mentu, and Tum being merely considered the sun at different periods of his diurnal course. Very little light is thrown on the esoteric nature of the deities by the monuments, and the classical sources are untrustworthy; but the antagonism of good and evil is shown by the opposition of the solar gods and the great dragon Apap, a type of darkness, and the hostility of Osiris and Set or Typhon. Some of the gods were self-existent, others emanated from a father, some were born of a mother only, others were the children of greater gods. Their energies and powers differed, and their types, generally with human bodies, have often the heads of the animals which were their living emblems, instead of the human. A few foreign deities became at the close of the 18th dynasty ingrafted into the religious system—as *Bar*, Baal; *Ashtarata*, Ashtaroth; *Anta*, Anaitis; *Ken*, Kiun; *Reshpu*, Reseph; *Set*, Satan. All the gods had human passions and affections and their mode of action was material; they walked on earth, or sailed through ethereal space on boats. The principal deities are Ptah, the opener, represented as a bow-legged dwarf or fœtus; the Phœnician Pataikos, the creator of the world; the sun and moon, out of chaos (*ha*) or matter (*Mu*), to whom belong Pasht, 'the lioness,' and Bast, Bubastis, lion-headed goddesses presiding over fire, and Nefer Tum, his son, a god wearing a lotus over his head. Next in the cosmic order is Khnum—worshipped at Elephantine—the ram-headed god of the liquid element, who also created the matter of which the gods were made; and connected with him are the goddesses Heka the Frog, or primeval formation, Sati, or 'sunbeam,' and Anuka, alluding to the genesis of the cosmos. The Theban triad comprised Amen-ra, 'the hidden' power of the sun, the Jupiter; *Mu*, the 'Mother' goddess or 'Matter,' the Juno; *Nit*, the 'Shuttle,' the Minerva; and Khons, 'Force' or Hercules, a lunar type. A subordinate type of Ammon is Khem, 'the enshrined,' who, as *Harnekht*, or Powerful

Horus, unites beginning and end, or cause and effect. The solar worship comprises *Ra*, the Sun, who traversing the *'sba*, or empyreal space of Gates, passes each hour a separate region, and as he descends behind the west hills of the horizon, becomes Atmu, also a demiurge; while as Mentu, a hawk-headed god, he is Mars, and as Khepra, a scarab-headed god, the male creative or existent principle, and is identified with Amen, Khnum, and other deities. Day and night, Ra and his satellites pursue the Apap or 'Giant' Darkness with alternate success. The souls of the blessed come off from earth, and entering the boat of Ra, there enjoy the perpetual streams of light which emanate from his orb. From *Ra* or Helios spring Shu and Tef the Gemini, Athor and Ma. *Seb* or 'Time,' and *Nu* or the 'Firmament,' gave birth to Osiris, Isis, Nephthys, Set, and the elder Horus, a group of terrestrial and infernal deities. The myth of Osiris destroyed by his brother Set, hewn in pieces, recovered by Isis, and avenged by Horus his son, embalmed by Anubis and the genii of the dead, and defended by Thoth, the Egyptian Hermes, at the 'great judgment' before his accusers, Set and the conspirators, was the type of the judgment and future destiny of man, and all deceased were called by his name: see OSIRIS. Numerous inferior deities, such as Hapi, the Nile, appear either as other forms of the superior deities or local varieties of the myths. Each deity had his sacred animal, which received a local worship, and which was considered to be the 'second life' of the deity it represented. The special animal selected was installed in the adytum of the temple, and gave oracular responses. The most remarkable of these animals was the Apis bull of Memphis, whose worship had a national extension. The Egyptians believed in the transmigration of souls, and all not sufficiently pure to be admitted into the courts of the sun, or whose bodies had perished before the expiration of 3,000 years, passed from body to body (see EMBALMING), having first descended to the Hades, and passed through the appointed trials and regions, endeavoring to reach the manifestation to light. In this progress, the soul was required to know and tell the names of the doors, regions, and their guardian demons through which it had to pass.

Ancient Civilization.—It remains to consider the old civilization of the Egyptians, which had made such strides at an early period of their history. In the sciences, as early as the 4th dynasty, the notation of time, the decimal system of numbers, weights and measures adjusted to a pound of 1,400 grains, the geographical division of the country, and the division of the year (of 365 days) into three periods (each of four months of 30 days) and twelve months, were already known ,while the form of the buildings implies a knowledge of geometry and its sister sciences. An empirical knowledge of astronomy was probably possessed; nor could the arts have reached such high development without some acquaintance with chemistry; and tradition assigns a knowledge of medicine and anat-

FALLAHEEN WATER CARRIERS, EGYPT.

omy to a still earlier age. The art of literary composition also existed in the 11th dynasty, for fragments of the religious or so-called Hermetic books of that age have reached us (see PAPYRUS); and Cheops himself was an author of renown. The language of the period, though concise and obscure, was nevertheless fixed; and a code of manners and morals, under the 6th dynasty, has been handed down. For the language of Egypt, see COPTIC: COPTS: HIEROGLYPHICS. Architecture had attained great refinement at an early period; not only were the chambers and temples, and other edifices, squared and directed to face the cardinal points, but the use of a kind of false arch, or stones disposed so as to form an angle overhead to relieve superincumbent pressure, *en décharge*, was practiced as early as the 4th, and the vault or arch was in existence in the 11th and 18th dynasties, eight centuries before that of the Cloaca Maxima of Rome. Columns were in use as early as the 4th dynasty; and in the 12th, the so-called proto-Doric columns of Beni-hassan, with their cornices and triglyphs, show that the Greeks derived this order of architecture from Egypt. The symmetric arrangement of the temples, consisting of rectangular court-yards and hypæthral halls of many columns, built before the original shrine, with their gateways slightly converging to the apex, and their bold and severe lines, and the obelisk (see OBELISK), and the pyramid (see PYRAMID), forms admirably adapted to resist the inroad of time, in addition to the remarkably fine masonry, prove the high development which this art had acquired at the remotest age. Nor was sculpture less advanced, for long before Dædalus, the statues of the 4th dynasty, at least B.C. 2000, had been molded with great accuracy to a fixed canon; and though Egyptian architectural employment had rendered their action rectilinear—such as the arms pendant, the left foot advanced, and the feet not detached but when in stone, with the part between them reserved—and the ears were placed too high in the head, and a kind of pillar was fixed behind in standing figures, yet in portraiture they had attained great perfection. Sculpture, indeed, in the human form was always restricted to a few conventional attitudes; but some of the lions and sphinxes, are executed with a spirit surpassing the power of Greek artists. A peculiar kind of bas-relief prevailed in Egypt, the figures being sunk below the surface like the intaglio figures of a gem, but in slightly convex relief, not concave. This style, called cavo-rilievo, or intaglio, has been most successful in preserving the hieroglyphs and anaglyphs of the monuments. Bronze statues cast from molds, and having a leaden or other core, were first made in Egypt, and subsequently introduced into Greece by Rhœcus. This art flourished best under the earlier dynasties, and had much degenerated in the 19th and 20th, though revived by the 26th. Painting appeared at the same age chiefly in temperà or white-washed surfaces, though fresco was occasionally used,

and encaustic appears only under the Greeks and Romans. This art, of course, was freer than sculpture, but yet had a rigid architectural character, and followed the same canon as sculpture, the colors used being generally the pure or primitive, and the background uniformly white. The architectural details of Egyptian temples and the hieroglyphs appear to have been always colored, and added additional charm to the sculptures. The religious papyri or rituals also were often embellished with elaborately colored vignettes, resembling the illuminations of modern manuscripts. Not less eminence had the Egyptians attained in the art of music, the harp and flute appearing in use as early as the 4th, and heptachord and pentachord lyres as early as the 12th dynasty; besides which, drums, tambourines, flutes, cymbals, trumpets, and guitars, are seen in the 18th, and the national instrument, the jingling sistrum in the 4th. Many of the instruments are of great size, and must have produced considerable effect. Nor was the art of song wanting, and measured recitations or songs occur on monuments of the 12th dynasty, while the lays of Maneros traditionally dated to a still earlier period. Poetry, indeed, was at all times in use, and the antithetic genius of the language suggested the application of the strophe and antistrophe (see HIEROGLYPHICS), though it is not possible to define the metre. In the mechanical arts, many inventions had been made: the blow-pipe, used as a bellows, appears in the 5th dynasty; bellows and siphons in the 18th. The saw, adze, the chisel, press, balance, and lever appear in the 5th, the harpoon in the 12th, razors in the 12th, the plough and other agricultural implements in the 5th. Glass of an opaque kind is seen in the 4th, and dated specimens in the reign of Thothmes III. (B.C. 1445), give the priority to Egypt (see GLASS); the oldest transparent glass, the Assyrian, not dating older than Sargina (B.C. 711). A glazed pottery or porcelain (see POTTERY), the potter's wheel, and the kiln, appear in the 4th; and the art of metallurgy, with the use of tin, at the same period. In the military art, the Egyptians used at an early age defensive armor of shields, cuirasses of quilted leather, and helmets; while spears, clubs, maces, swords, daggers, bows, and hatchets formed their offensive weapons. For sieges, they employed the testudo, ladders, torches and lanterns, and mines. The army was composed of infantry till the beginning of the 18th dynasty, when war-chariots were introduced; for, prior to that period, the ass only was known and used for transport; and carriages not having been invented, persons and goods were transported on the panniers of asses, or on a kind of saddle slung between two of these useful animals. War-boats no doubt existed at an early period, and are mentioned as early as the 12th dynasty; but sea-going vessels not till the 18th, and no fleet till the 19th. The Nile, however, was constantly navigated by row-galleys with sails. An extensive commerce was carried on with neighboring nations, and

COLOSSUS OF MANNON, EGYPT.

their tribute enriched the country with slaves, cattle, gems, valuable metals, and objects of curiosity. Rare animals were collected for ostentation. Under the earlier dynasties, the chief occupation of the nation appears to have been rearing cattle, cultivating grain, indulging in banquets, fishing, fowling, and the chase, and the establishment of each noble contained in itself all the organizations and artificers necessary for its maintenance. How transactions were carried on without the use of money, is not very clear, unless gold circulated moulded in the shape of rings adjusted to a given weight, but coin plate is mentioned by its pounds, *mna*, and its ounces, *kat*. The Persians first introduced money: see NUMISMATICS. The wealth of families was, however, spent on the tombs and furniture of the dead, and the preparations for embalming, which were on so vast a scale that filial piety did not disdain to mortgage not only the sepulchres, but the very mummies of its ancestors: see EMBALMING. Amusements were various, from the single-stick and juggling, the dance of almeh, the bull-fight, to draughts, dice, and morris. In fact, ancient Egypt had a material civilization, which exerted all the requirements of industry, and forgot none of idleness. Pleasure was the object of existence, not, however, untempered by the voice of reason or the appeals of conscience, the moral code of duties being as pure as that of contemporary nations.

The civil government was administered by the three upper castes. The priests, distinguished by their superior knowledge, cleanliness, and godliness, had the ecclesiastical; the temples being administered by high priests and an inferior hierarchy, with overseers, and governors of revenues, domains, and donatives. Each temple, like a monastic institution, had its carefully subdivided organization, each denizen having a separate charge or jurisdiction. The political and civil government was administered by royal scribes, or secretaries of state, who attended to the revenue, justice, foreign affairs, and all the interests of the executive. Sacred scribes attended to the ecclesiastic interests, and inferior scribes to the local interests. The public works, the collection of grain, and of the linen dues; the cattle, workmen, wells, irrigation, had each their separate superintendents and scribes. The military force of 410,000 men, at a later period, comprising all arms of the service, was ruled with severe discipline, and under the direction of nomarchs (*ha*), colonels (*hrai*), captains (*mer*), and lieutenants (*atnu*). The criminal and civil law was administered by judges (*satem en ash*), who held travelling assizes, and to whose tribunals the necessary officers were attached. The athlophoros or standard-bearer also transmitted the decrees of the royal chancery. The execution of deeds required so many witnesses that fraud evidently often occurred. The superior position of women in the social scale, notwithstanding the permission to marry within degrees of consanguinity usually forbidden, shows that the Egyptians reached a higher point of delicacy

and refinement than either their western or eastern contemporaries. Colossal in its art, profound in its philosophy and religion, and in possession of the knowledge of the arts and sciences, Egypt exhibits the phenomenon of a surprisingly high and ancient civilization.

Chronology and History.—One of the most important points of Egyptian history is the chronological, involving as it does the date of the earliest historical epoch of man. In the time of Ptolemy Philadelphus, B.C. 3d c., Manetho of Sebennytus, high priest of Heliopolis, drew up, at the request of the king, a history, in which he divided the space of time from Menes to the reconquest of Egypt by Darius II. into 30 dynasties. The work of Manetho has perished, but chronological epitomes remain in the works of Julius Africanus, a writer of A.D. 300, and Euse'ius, and Georgius Syncellus, A.D. 800. Besides the Bible Herodotus, Diodorus, Josephus, and other writers, especially Eratosthenes, also contained sources of chronological information, and the learned of Europe for the last three centuries have studied to reconcile the conflicting statements of these authors, the discrepancy of their ciphers, and the inaccuracy of their details. Even in Biblical chronology, the Hebrew, Samaritan, and Septuagint versions gave very different results; but in England the chronology of Usher, which, from the Hebrew, placed B.C. 4004 as the date of creation, and B.C. 2348 for the Deluge, somehow obtained the sanction of theological writers, though it is conceded by later scholarship to be without sure basis. To reconcile these conflicting authorities, two schools of chronological critics, called of the Long and Short Chronology, have arisen, and the epoch of Menes has been placed by the advocates of the long chronology, as Boöckh, at B.C. 5702, by Bunsen, at B.C. 3643, by Lepsius, at B.C. 3892, by Henry, at B.C. 5305; while the same date falls according to Sharpe, B.C. 2000, to Nolan, B.C. 2673, and Poole, B.C. 2717. Unfortunately, the monumental information is defective at certain periods, while in all, the national custom of dating in kings' reigns only, without the use of the controlling date of any cycle, renders the subject still more obscure; for the Sothic cycle, or Dogstar period of 1461 vague years, was not in official use. The celebrated hieratic papyrus at Turin, of the age of the 19th dynasty, which contained a system of chronology arranged on a principle of cyclic and regnal years, has unfortunately suffered so much mutilation that it is impossible to reconstruct it satisfactorily. It is therefore better to arrange the history according to the dynastic successions of Manetho, giving these as waves of time, leaving the question of their duration to individual judgment. At present, the elaborate systems of chronology are only chronological draughts from recollection of a vast ruin, each more or less fortunate or defective in some particular respects or general conception. There are not sufficient monumental data for a sure conclusion about the remoter dynasties. Mythically, Egypt was said to have

HATHORIC COLUMN, TEMPLE OF DENDERA.
(Restored.)

been governed first by a dynasty of gods, who, according to Manetho and other Greek authors, were Vulcan or Ptah, Helios the Sun or Ra, Sôs or Shu, Saturn or Seb, Osiris or Heshar, Typhon or Set, and Horus or Hor. These gods reigned 13,900 years, and were succeeded by the Manes and demigods, whose reign occupied 4000 more years. But considerable difference exists in the lists—that of Thebes giving Amen, Mentu, Tum, Su and Seb, Osiris, Seti, and Horus; that of Memphis, Ptah, Ra, Shu, Seb, Osiris, Set, and Horus. After the reigns of the gods, the epoch of Menes is the first point in the chronology of the history of ancient Egypt, and has been placed as above mentioned, by the rival systems of chronology.

No contemporary monuments of Menes exist, but he is said by tradition to have corrupted the simplicity of the patriarchal life of the nation, instituted the first laws, and divine worship, founded the temple of Ptah by turning the course of the Nile to the w. by means of a barrage at Kosheishe, and to have founded Mennefer or Memphis, after some expeditions against the Libyans, and to have been devoured by a crocodile. The statue of Menes is represented borne in ancestral procession in the reigns of Rameses II. and III. at Thebes, but no contemporary monument of this monarch exists. His successor Athothis, wrote a work upon anatomy, and built the palace of Memphis. The other kings of this dynasty were Kenkenes, Venephes, who built the Pyramids at Ko or Kochome, Miebis, Semempses, and Bieneches; but their names have not been identified, nor do any monuments of them remain. This dynasty reigned about 250 years, and was succeeded by the 2d, which lasted about 300 years, but of which no contemporary monuments remain. This dynasty, however, introduced the worship of sacred animals, and abolished the Salic law, which had hitherto prevailed. With the 3d dynasty of Memphites, which endured about 200 years, monumental history properly begins, the monumental king Seneferu of this dynasty having conquered the Sinaitic peninsula, and opened the copper mines of the Wady Magara. The 4th dynasty, also of Memphites, had an existence of 284 years. The celebrated canon of Turin contains fragments of the duration of the reigns and lives of the monarchs of this line, some of which were prolonged to upward of 90 years. Monumental remains are found of Soris. The two Khufus built the two great Pyramids of Gizeh, and held the Arabian peninsular in subjection. Cheops, or the elder of the two Khufus, constructed the largest of this group of the pyramids by means of a forced conscription, and was regarded as a detestable and impious tyrant. Subsequently, he repented, and wrote a book in honor of the gods, which had great reputation. Khafren, his successor, built the second of the great pyramids, and Mencheres, or Mycerinus, the third pyramid. The so-called book of the Ritual, which dates from this period, and the high civilization, which Memphis had then attained, mark an epoch in

Egyptian civilization, and the numerous tombs, in the vicinity of the pyramid, constructed during this and the subsequent dynasty, exhibit a highly advancing civilization; the cultivation of farms, the chase, the arts, received much attention; but horses and wheel-carriages were alike unknown, though the simpler mechanical instruments and manufactured articles had been invented.

The 4th dynasty began, according to Lepsius, B.C. 3427. The 5th, which monumentally appears a continuation of the 4th, terminates with Annos or Onnos, who was killed by his guards. His sepulchre was the pyramid of the Mastabat-el-Faraoun near Saqqarah. This 5th dynasty was, however, from Elephantine, and appears to have ruled in Upper as well as Lower Egypt, monuments of it being found in the Thebaid. Considerable difference, however, exists between Lepsius and Bunsen in the assignment of the royal cartouches of this period, Lepsius assigning them to the 5th, and Bunsen to the 3d dynasty. The group of the Abooseer Pyramids is of this age. The next dynasty, the 6th, a Memphite, was more remarkable; and tombs and numerous small objects of the period are found in Upper and Central Egypt, and in the valley of Hamamat, leading from Coptos to the Red Sea. The principal monarchs of this line were Othoes, killed by his guards; Phiops or Apappus, whose reign extended to 100 years; and Nitocris, whom the legends represent as drowning the murderers of her brother, and constructing the third Gizeh Pyramid, in which she was buried, and which she perhaps enlarged from the old original sepulchre of Mycerinus, having added to it the revetment of red syenitic granite. Of the 7th dynasty, two names, An and Assa, are supposed to have been found; but the monumental connection between the close of the 6th and 11th dynasties, has not been even conjecturally restored, from the conflicting tablets of Karnak and Abydos, and the mutilated papyrus of Turin. It is not possible to follow the order of the succession till the 11th dynasty, nor are there monuments either of a public or sepulchral nature to show the existence of the intermediate period, rendered more unintelligible by the contemptuous silence of the lists of Manetho, one tyrant, Achthoes, alone being mentioned in them. Considerable discrepancy exists between the canon of Turin and the lists of Manetho relative to this period; the canon making two dynasties—one of six, the other of 17 kings between the 6th and the 12th dynasty; Manetho, 86 kings, and about 500 years. The impossibility of reconciling these statements has given rise to the idea, that the lists were respectively Memphite and Theban, each having contemporary kings. The existence, however, of the 11th dynasty, consisting of a line of monarchs called Hantefs and Mentuhetps, has been proved by the discoveries of their coffins in the tombs at Gournah and the El Assasifs, and the tablets of the island of Konosso and others, referring to the construction of the fortress of Coptos and in honor of the local god. The successive reigns and monarchs of the

CROWNS OF UPPER AND LOWER EGYPT, EDFAU.

12th dynasty are fixed by numerous monuments. Amenemha I., founder of the line, opened the quarries of Tourah, embellished An or Heliopolis, and founded the temple of Amen at Thebes, reigning nine years alone, and seven with Osirtesen I., his successor. A historical papyrus recording his dreams and other facts of this reign remains. The monuments of Osirtesen I. exist in the Faioum at Benihassan and Heliopolis; he subjected some of the Ethiopian tribes. During his reign there occurred a famine; and in the 38th year of his reign, he associated Amenemha II. in the government for four years. Little of historical import is known of his successors, Amenemha II. and Osirtesen II., except their conquest of Kash or Ethiopia, and the arrival of a tribe of 36 Amu or Semitics in the sixth year of Osirtesen II. These resemble, in their costume and physiognomy, the Hebrews, and have been supposed to represent the arrival of Jacob in Egypt. Osirtesen III., his successor, established the s. frontier at Samneh, which he fortified; and was subsequently deified in Nubia, and received, in the reign of Thothmes III., a worship in that region, and fortified Coptos. His successor, Amenemha III., excavated the Birket-el-Keroun or Mœris lake; constructed the Labyrinth, composed of 6,000 rooms; the Pyramid of Crocodilopolis, in its vicinity; and the temple of the goddess Athor at the Sarabout-el-Khadem. His successors, Amenemha IV. and the queen Sebeknefru, are known only from the remains of the Labyrinth, and some inferior monuments. The same difficulty of tracing the succession which exists between the 6th and 12th, occurs again between the 12th and 15th. The most plausible conjecture, however, is that the 13th (Diospolite) and the 14th Xoite dynasty, in Lower Egypt, were contemporaneous, and that the 15th and 16th Theban and Diospolitan had for their contemporaries the 17th Hykshos or shepherd dynasty in Lower Egypt. The monarchs of the 14th dynasty appear from the monuments to have been occupied in regulating the course of the Nile at Samneh, while their power reached from the isle of Argo to El Hamamat, and they engaged in traffic with the Phœnicians. About B.C. 2000, the advance of the Assyrians in Asia, or some internal revolution, precipitated the so-called Hykshos or Shepherd Kings, who appear to have been Arabs or Phœnicians, on Lower Egypt. These invaders overthrew the Xoite dynasty of Lower Egypt, took Memphis by assault, and established themselves in the city of Haouar or Avaris, subsequently called Tanis, where their monuments still exist. But the Egyptian rulers of Upper Egypt overthrew their rule, and under Ra-skenen, the last king of the 16th dynasty, Avaris was invested, while his successor, Aahmes I., of the 17th, took it by assault, besieged Sarahan or Sharon, and attacked the mountaineers of Nubia. The Hykshos endeavored to substitute the worship of Sut or Set for Ra or the Sun, but Aahmes I. restored the ancient temples, and opened the quarries of Tourah. Amenophis I., his son

and successor, who reigned under the tutelage of his mother, continued the Ethiopian campaigns, and embellished Thebes. Thothmes I. carried his arms to Tombos, in the heart of Nubia, and into Naharaina or Mesopotamia, and embellished Thebes. Thothmes II., who reigned under the guardianship of Hatasu, defeated the Shos. His brother and successor, Thothmes III., elevated Egypt to the highest pinnacle of glory; and by the victory of Megiddo, in his 23d year, subjected the whole of Syria and part of Mesopotamia to his arms, receiving immense tributes from Kash and the Ethiopian races of the south, the islands of the sea, and Assyria, Babylon, Phœnicia, and Central Asia, and endowing the Temple of Thebes with the revenues of tributary cities. A calendar preserved at Elephantine recording the heliacal rise of the Dog-star on the 28th Epiphi, shows that the year B.C. 1444 fell in his reign. Thothmes III. recovered the copper mines of Magarah, and decorated all Egypt. Amenophis II. continued the conquests of the Ruten, took Nineveh by assault, and vanquished the Ethiopians. Thothmes IV. is supposed to have erected the Great Sphinx. Amenophis III. maintained the frontiers of the empire. At this period, a heresy was introduced into Egypt, favored by the queen Taia. Amenophis IV. became a worshipper of the Aten or solar orb, to the exclusion of the other deities of Egypt, especially of Amen Ra. The capital was removed to Tel-el-Amarna of Alabastron; the king changed his name to Akhuenatnen, and a succession of three heretic monarchs ruled Egypt for about 33 years, till Haremhebi or Horus restored the old faith and the limits of empire.

The link which connects the last monarchs of the 18th to the monarchs of the 19th dynasty has been lost; but Horus was succeeded by Rameses I.—the first of a long line of monarchs—who appears to have formed a treaty with the Khita or Hittites, and to have advanced the conquests of Egypt to the Wady Halfa. He was succeeded by Seti I. or Sethos, who attacked the Remenu or Armenians, the Rutennu, and the Shasu or Shepherds, who had again advanced to the Pa-khetem or Pithoum, on the confines of Egypt. Naharaina or Mesopotamia, and Sharu or Syria, Pânt or Phœnicia, had also been invaded by his arms. The city of Atsh or Katsh, the supposed Cadytis, also was besieged by Sethos, whose Asiatic victories introduced into Egypt the worship of Baal and Ashtaroth. Tyre, Avathus, and Bethanath in Canaan, were garrisoned by his forces. Egypt was also embellished with many noble monuments in his reign. He was buried in a deep excavated rock-tomb in the Biban-el-Molook—the kings of the 18th and 19th dynasties having substituted long excavated tunnels or syringes, in the mountains of the Arabian chain of W. Thebes, for the ostentatious pyramids in use from the 4th to the 12th dynasty, which attracted the cupidity of the invaders of Egypt. Rameses II., son of Seti I., seems to have succeeded him at the very youthful age of seven. In

GRAND COLONNADE TEMPLE OF LUXOR, EGYPT.

his fifth year, he defeated the Khita and their Syrian confederates at the battle of Katsh, in which many of the princes and officers of the Khita were drowned in the river Arunata, or Orontes. The battle endured two days, and the panegyrie of an Egyptian scribe, Pentaur, has invested Rameses with the power of a god. The war lasted till his ninth year, and the king took Shaluma or Salem, the ancient site of Jerusalem, and other eities. In his twenty-first year, a treaty of peace and extradition was established between the two eountries, and Rameses married a princess of this nation. It is the tablet of this monareh whieh is found at the Nahr-el-Kelb, or Passes of the Lyeus, near Beyrout. This monarch subjected Ethiopia, whieh had revolted, to his arms, reimposed the tribute, and placed the country again under the government of the prineess of Ethiopia, or Egyptian viceroys. He also established a fleet on the Mediterranean. His name and reputation formed the basis of the legendary Sesostris; the exploits of the monarehs of the 18th dynasty, and probably of his sueeessors, being united with his fame. The reign of Rameses, though it exhibits a deeline of art, yet demonstrates Egypt to have been in the height of its glory; and his epoch appears to have been about B.C. 1322, a speeial calendar having been seulptured to record the eoineidence of the heliacal rising of the Dogstar and 1st Thoth, or commencement of the fixed and eanieular year. His place of burial is uneertain—perhaps in the vaults of the Ramesseum. His 13th son, Merienptah or Menephthes, succeeded him upon the throne, transferred the eapital to Memphis, sueeessfully contended with the Tamahu or Libyans and the Rabu, and appears to be the Amenophis of Manetho, and the Pharaoh of the Exodus. He introdueed the heretical worship of Sut, Seth, or Typhon, and was sueeeeded by Sethos II., Amenmes, Siphthah, Tausri, and Setinekht, whose inglorious reigns close the 19th dynasty. The conneetion of Rameses III. with the previous dynasty is obscure. This monareh was chiefly at war with the Philistines, and the other maritime tribes of Greeee and Asia Minor, and gained naval victories in the Mediterranean, and repeated the conquest of Ethiopia. He was followed by the splendid but inglorious line of the Ramessids, the sixth of whom gained vietories in Ethiopia; and the twelfth of whom, having married a prineess of the land of Bakhten, sent the ark of the god Khous to Bakhten, at the request of the monareh of that eountry, for the eure of the queen's sister. The fall of this dynasty appears to have been owing to internal revolution, as their Tanite suceessors held the offiee of high priests of Amen Ra-at Thebes. They held the government for 130 years, and entertained foreign relations, one of the monarchs having married a princess of the Rutennu. The 22d dynasty, the monumental, is rather confused. They were also high priests of Amen Ra. Shashank I. is the Biblieal Shishak. His invasion of Israel, with 12,000 ehariots and 60,000 eavalry, and the capture of Jerusalem, is recorded on the portico of the

Bubastites at Karnak. The other monarchs of this line, Osorkon I., Takelot I., and their successors, have left no remarkable records; and the dynasty, which appears of foreign origin, is more chronologically than historically important, the taking of Jerusalem falling between B.C. 989 and 959. The 23d Tanite dynasty, which succeeded it, exhibits a decadence in Egypt, and was succeeded by the 24th dynasty, of a single monarch, the celebrated Bekenrenf or Bocchoris, who reformed the laws; but having been taken prisoner by the Ethiopian Sabaco, of the 25th dynasty, was burned alive. From this period, the history of Egypt becomes involved with that of Judæa and Greece. Tirhaka came to the assistance of Hezekiah against Sennacherib, and built the temple of Gebel Barkal. According to this Assyrian cuneiform inscription, the Ethiopians were expelled by the Assyrians, and the country placed under various monarchs. This state of affairs was closed by the rise of Psammitichus I. of the 26th dynasty, who, by the aid of Greek mercenaries, overthrew the other petty princes. His age marks a revival in art, and restoration of the old constitution of the empire. His successor, Nekao, or Nechos II., planned the canal across the isthmus of Suez., from which he desisted, warned by the advice of an oracle, after having lost 120,000 men in the attempt. Under his reign, the Phœnician navigators first passed the line. After defeating Josiah, king of Judah, and conquering Palestine, he was himself defeated by Nebuchadnezzar at Karkemish. Psammitichus II. carried his arms into Ethiopia. Apries, his successor, having lost all the conquests, was deposed by Amasis, his successor, and strangled. Amasis favored in different ways the Greek colonies in Egypt, and married a Cyrenæan wife, and conquered Cyprus, but incurred the enmity of Cambyses, who overthrew his son and successor at the battle of Pelusium (B.C. 526–7). Cambyses treated Egypt with considerable moderation, but after an unsuccessful expedition against the Ethiopians, lost his reason, stabbed the bull Apis, and committed various atrocities. His successor, Darius I., governed Egypt with more prudence; but Xerxes I. and Artaxerxes I. had successively to reduce it to subjection, which they did in spite of assistance rendered to it by the Athenians. The 27th dynasty of Persians was followed by the Saite line, the 28th, Amyrtæus and Pausiris, who still held ground against the Persians; the 29th, Mendesian dynasty of Nepherches and Achoreus, maintained a Greek alliance; and the 30th, Sebennytic, consisted of Nectanebes I., who successfully resisted Pharnabazus and the Iphicrates; of Teos, who employed Agesilaus; and Nectanebes II., who fled into Ethiopia before the Persians (B.C. 340).

From this time, Egypt remained a province of Persia till its conquest by Alexander the Great, who founded Alexandria. Subsequently, Egypt passed under the Greek rule, and the language of the government, and the administration and philosophy, became essentially Greek.

The court of the Ptolemies became the centre of learning and philosophy; and Ptolemy Philadelphus, successful in his external wars, built the Museum, founded the library of Alexandria, purchased the most valuable of manuscripts, engaged the most celebrated professors, and had the Septuagint translation made of the Hebrew Scriptures, and the Egyptian history of Manetho drawn up. His successor, Eurgetes, pushed the southern limits of his empire to Axum. Philopator (B.C. 221–204) warred with Antiochus, persecuted the Jews, and encouraged learning. Epiphanes (B.C. 204–180) encountered repeated rebellions, and was succeeded by Philometor (B.C. 180–145) and Euergetes II. (B.C. 145–116), by Soter II. and Cleopatra till B.C. 106, and by Alexander (B.C. 87), under whom Thebes rebelled; then by Cleopatra Berenice, Alexander II. (B.C. 80), and Neos Dionysus (B.C. 51), and finally by the celebrated Cleopatra; and after the battle of Actium (B.C. 30), Egypt passed into the condition of a province of Rome, governed always by a Roman gov. of the equestrian, not senatorial rank.

The most important events in Egypt under the Roman rule were—the introduction of the Julian year by Augustus (B.C. 24), the visit of Vespasian to Alexandria (70), and that of Hadrian (122), the development of the Gnostic heresy, the visit of Caracalla (211), the conquest of Egypt by Zenobia (270), the revolt of Firmus (272), the persecution of Diocletian (304), and the rise of Manicheism, the great Arian controversy in the reign of Constantine, the rise of asceticism, magic, and astrology, and the final destruction of paganism (379).

At the division of the empire (395), Egypt fell to the Eastern Empire, and, at its fall, had become one of the Great Patriarchates of the Christian Church; but owing to the religious feuds of the Jacobites and Melchites, it became a province of Persia (616) for 12 years. The Coptic gov. Makaukas, who reigned in the name of Heraclius, endeavored to make himself independent, and invited the arms of the Arabs, and Omar I. easily conquered Egypt, in the 19th year of the Hegira (640).

History since the Mohammedan Conquest.—Although Alexandria was retaken by Constantine III., the Arabs drove him out, and Egypt remained an appanage of the califat. It afterward passed into the dynasty of the Thonlounides (868): a new dynasty, the Akshidide, succeeded in 935, to give way to the Fatimide in 969, under which Cairo was built, and Egypt regained some of its prosperity, although in 1118 Baldwin I. burned the maritime town of Faramah. Subsequently it passed under the Ayoubites, and Saladin, who fortified Cairo, built the citadel, excavated the well, and erected the granaries of Jusuf. In 1218, the Crusaders took Damietta, but were subsequently driven back 1221. One of the later princes, Saleh-Nedjim Eddin, built the castle of Rhodah, and created the order of Mamelukes; but Louis IX. of France (1248) took Damietta and gained the bat-

tle of Mansourah. In 1254, the Ayoubites entirely fell, and Egypt became subject to the Baharite and Bordjite Mamelukes, under whose government it flourished, and even pushed its conquests to Cyprus and Asia Minor, till, in 1517, Touman Bey fell into the power of Selim I., and Egypt became a province of the Turks, and administered by pashas. In 1601, the use of tobacco was introduced. Constant rebellions of the Mamelukes, and the violence of contending factions, distracted the country. The most remarkable event of this period was the French invasion by Bonaparte 1798, which by the conquest of Alexandria, and the battle of the Pyramids against the Mamelukes, led to the entire subjection of the country, from which the French were finally expelled by the Turks and British 1801, and the country restored to the Ottoman Porte. The rise of Mohammed Ali 1806 imparted a galvanic prosperity to Egypt, by the destruction of the Mamelukes, the formation of a regular army, the increase of security, the improvement of the irrigation, and the introduction of European civilization. In 1816, Mohammed Ali rendered part of Arabia tributary by means of his son-in-law, Ibrahim; and afterward wrested Syria from the Porte, and held it as tributary by the treaty of Kutahia 1835. The victory of Nisib, 1839, would have elevated him to the throne of Constantinople; but the quadruple alliance in 1840, the fall of St. Jean d'Acre to the British, and the evacuation of Syria, compelled him to limit his power to the pashalik of Egypt. Ismail Pasha reduced Nubia to a dependency of Egypt 1820. In 1849, Mohammed Ali died, and was succeeded by Abbas Pasha, his grandson, replaced in turn by Said Pasha 1854. M. de Lesseps now obtained the previously withheld co-operation of the Egyptian govt. in his scheme of the Suez Canal (opened 1869). Said was succeeded 1863 by his nephew, Ismail, who, by leave of the sultan, took 1866 the hereditary title of khedive (q.v.). The same firman made the succession to the throne of Egypt direct from father to son, instead of descending, according to Turkish law, to the eldest heir; and 1873 the sultan granted to the khedive the right (withdrawn 1879) of concluding treaties and that of maintaining an army. Darfur was annexed to Egypt 1874, and in that and the following year further conquests were made in the south. Through Sir Samuel Baker and Gordon Pasha (Gen. Gordon), gov. of the Soudan, the khedive endeavored to suppress the slave-trade in his dominions. In 1875 the khedive sold to Great Britain 177,000 shares in the Suez Canal (q.v.) for £4,000,000.

The condition of the Egyptian finances was almost hopelessly involved, when in 1876 the revenue was put under the management of European commissioners. An Egyptian contingent of about 10,000 men, under command of Prince Hassan, third son of Ismail Pasha, fought for the crescent in the Russo-Turkish war of 1877-8. The new financial system having proved unsuccessful, another

commission of inquiry was appointed; and erelong it was announced that the khedive had absolutely accepted the European system of constitutional government, and had made Nubar Pasha head of a reformed administration. The summary dismissal of this ministry 1879, Apr., was followed by the interference of the European governments. The khedive, who declined voluntarily to abdicate, was at the instance of the western powers, deposed by his suzerain the sultan in June, and Prince Tewfik, Ismail's eldest son, was proclaimed viceroy of Egypt. He died 1892.

A law of Liquidation, for regulating the conditions of the public debt, was passed at the instance of five European powers 1880. In the next year came the military revolt under an officer, Arabi Pasha, who demanded from the khedive an immediate change of ministry, and the increase of the army to 18,000 men. The khedive yielded. Growing dislike to European interference, and to the presence of European officials, secured Arabi a large measure of popular support, when, as war minister, he overawed the khedive, and ultimately defied his authority. He was practically a military dictator, and in 1882 strengthened the fortifications of Alexandria. British and French war-ships had been dispatched to Alexandria; and the British admiral demanded that work at the fortifications should be discontinued. Arabi persisted; and after an atrocious massacre of Europeans in the streets of Alexandria, the British ships bombarded the fortifications (July 11). The Egyptian troops were suddenly withdrawn from Alexandria, whereupon the city was plundered and partly burnt by riotous Egyptians. An English military expedition was manifestly inevitable; troops were now swiftly dispatched from England and from India, including a large contingent of native Indian soldiers. The point of debarkation was Ismailia, on the Suez canal; and in 25 days the British forces under Wolseley had traversed the desert, utterly defeated the main body of Arabi's army at Tel-el-Kebir, and occupied Cairo. The authority of the khedive restored, most of the British troops were withdrawn, and measures taken for the reorganization of the country. The French, who had been associated with Britain in what was known as the Anglo-French Control, took no share in the bombardment, in the military expedition, or in direct co-operation with Britain in the re-arrangement of Egyptian affairs on a fair basis. Many of Arabi's supporters were executed; Arabi was banished to Ceylon. The aim of the English cabinet was to secure, as soon as possible, a firm and lasting government under the khedive, but a large measure of interference with the Egyptian government was for the time being inevitable. The attempt to persuade the khedive's government to rule according to English ideas, and to get English officials and their Egyptian colleagues to work smoothly together, led to repeated crises and changes of plan. A conference of the great powers 1884

did not sanction the English scheme for managing Egyptian finance; and the English government had gradually to assume more direct responsibility in Egypt. A severe visitation of cholera occurred in the summer of 1883; about 150,000 persons were thought to have perished.

The Rebellion in the Soudan and Later Events.—Baker Pasha's annexations, 1874 and following years, had extended the possessions of Egypt s. to the shores of the Victoria Nyanza; but Arabi's revolt had the effect of weakening the khedive's authority in those territories. Rebellion was fomented in Darfur and Kordofan by Mohammed Ahmed, styled the Mahdi (q.v.: see also ISMAILIS: MOHAMMEDAN SECTS: KARMATHIANS). The Mahdi sent his missioners forth to preach the doom of Turkish rule in the Soudan and the advent of 'the one guided by God.' The Mahdi occupied El Obeid 1883, Jan.: an army under Hicks Pasha (q.v.), an English officer, was annihilated near El Obeid 1883, Nov. Meanwhile Charles George Gordon (q.v.) had been commissioned to visit the Soudan and to conciliate the rebels by giving back to the local sultans their ancestral powers withdrawn or suspended during Egyptian occupation, and by retiring the Egyptian garrisons. Gordon having reached Khartoum, found the Mahdi unwilling to treat. The Mahdi demanded the unconditional surrender of the town, and on Gordon's refusal, laid siege to it, and it was captured 1885, Jan. 26; Gordon and nearly all the Europeans in the place, military and civil, were massacred. An expedition commanded by Gen. Lord Wolseley reached Khartoum two days after Gordon's death, but withdrew without any attempt to retaliate, and the Soudan was for the time left to its anarchy.

The work of deepening and widening the Suez canal, so as to add 15 metres (about 50 ft.) in width, and to make its depth 8½ metres (about 28 ft.), was begun 1886; a loan of $20,000,000 was raised for making the enlargement. The *corvée* or system of forced labor on the irrigation canals was abolished 1887; the same year, under an international convention, the Suez canal was declared exempt from blockade and military operations, and ships of all nations were assured unimpeded passage in peace and war. The Khedive Tewfik died 1892, Jan. 7, and was succeeded by his eldest son, Abbas, who made efforts in 1893 and 1894 to shake off the English control of the administration, but was compelled to submit by the prompt action of Turkey forced by England. A steady increase in the prosperity of the country and surplus revenue amounting to a total of over $25,000,000 in 1895, which however can only be used to extinguish the debt, has resulted from English rule.—See SUDAN: NUBIA: KORDOFAN: DARFUR: MEHEMED ALI: NILE: also BAKER, Sir SAMUEL WHITE: GORDON, CHARLES GEORGE: HARAR: ETC.

Statistics of Modern Egypt.—The area of Egypt proper is about 400,000 sq. m., and at census of 1897 (latest) its

pop. was 9,734,405. With territories in central Africa, now no longer Egyptian, area of Egyptian domains was estimated 1,150,000 sq. m., with population of 17,000,000. Chief towns of Egypt proper are Cairo (pop. 1897, 570,062); Alexandria (319,766); Damietta (31,515); Tantah (57,289); Mansourah (36,131); Zagzig (35,715); Assiout (42,078); Port Said (42,095); Kena (27,478). There are in Egypt about 112,500 foreigners, including 38,175 Greeks, 24,467 Italians, 42,095 Frenchmen, 19,557 Englishmen. Estimated revenue 1902 was $60,000,000. Expenditure $55,000,000. Principal of debt, 1902, $516,322,700. Total exports 1902 valued at $88,085,015, chiefly cotton, cottonseed, beans, sugar, grain; imports, $74,073,440, chiefly cotton goods and other textiles, machinery, and coal. Railway system comprised more than 1,250 m. connecting Alexandria and Damietta with Cairo and Suez canal, extending up Nile valley as far as the Siout; telegraph lines reached nearly 5,200 m. and there was a telephone between Cairo and Alexandria. Egypt paid a tribute of $3,325,205 to Turkey 1902, maintained a native army of 13,000 men and an English army of occupation of 3,200.

For further information on Egypt, its history, antiquities, and present condition, see Bunsen, *Aegyptens Stelle* (1845–57); Lepsius, *Denkmäler* (1849–74) and other works; Sharpe, *History of Egypt* (1846); Brugsch, *Histoire d'Egypte* (1849; new ed. 1875); Wilkinson, *Manners and Customs of the Egyptians* (1847; new ed. by Birch, 1879); Lane, *Modern Egyptians* (1842); M'Coan, *Egypt as it is* (1877); Jerrold, *Egypt under Ismail Pasha* (1879); Rawlinson's *History of Ancient Egypt* (1881); S. T. Poole's *Egypt* (1881); E. Wilson, *The Egypt of the Past* (1881); Professor Eber's *Egypt, Historical and Descriptive* (transl. 1882); Bénédite, *Egypt* (1900).

EGYPTIAN, a. *ē-jĭp'shĭ-ăn* or *-jĭp'shăn* [Ger. *Aiguptos*—from *gaia*, land; *koptos*, Coptic]: pertaining to Egypt or the Coptic land. N. a native of Egypt; in *OE.*, a gypsy. E'GYPTOL'OGY, n. *-tōl'ŏ-jĭ* [Gr. *logos*, discourse]: study of the archeology of Egypt, particularly in connection with hieroglyphics. EGYPTOL OGIST, n. one skilled in the knowledge of hieroglyphics. E'GYPTOG'RAPHY, *n. -răf-ĭ* [Gr. *grapho*, I write]: the art of writing in hieroglyphics or picture symbols. EGYPTIAN-BEAN, n. probably the fruit of *Nelumbium speciosum*. EGYPTIAN-BLUE, n. pigment of a brilliant color, made of hydrated protoxide of copper mixed with a very small quantity of iron. EGYPTIAN-JASPER, n. variety of jasper with zones of brown and yellow; found in the desert between Cairo and Suez. EGYPTIAN-THORN, n. in *bot.*, *Acacia* (q.v.) *vera*.

EGYPTIAN VULTURE, *ē-jĭp'shan vŭlt'yôr* (*Neophron percnopterus*): one of the smaller *Vulturidæ*, of a genus differing from the true vultures in the slender bill, which is covered half its length with a naked cere, and sharply hooked at the point. The head and throat are naked, but feathers extend along the back of the neck

to the crown. The Egyptian vulture is not much larger than a raven. The plumage of the male is white, except the great quill-feathers, which are black. This bird is plentiful in Egypt, where it renders important service—as also in Turkey, Syria, and other countries—in devouring and so cleansing away carrion from the vicinity of human abodes. It is constantly seen in the streets of towns, and seems aware that it is regarded with favor, and enjoys the protection of mankind. Europeans in Egypt often call it Pharaoh's Hen, or Pharaoh's Chicken. It follows caravans in the desert, to devour whatever dies. Numbers are often seen congregated together, but the Egyptian vulture is not truly gregarious, and lives generally in pairs. Its geographic range extends over the whole of Africa, and great part of Asia; it is common in many parts of the south of Europe, is an inhabitant of the Alps and the Pyrenees, sometimes visits more northern regions, and has been killed in England.

EH! int. *ĕ* or *ā* [AS. *æ* or *eā*, eh!]: a word expressing inquiry or slight surprise.

EHRENBERG, *ā'rĕn-bĕrĕh*, Christian Gottfried: 1795, Apr. 19—1876, June 27; b. Delitzsch, Prussian Saxony: naturalist. He studied medicine at Leipzig and Berlin, applying himself specially to botanical subjects demanding the microscope—whose capabilities Ehrenberg was one of the first to appreciate. In 1820, Ehrenberg visited Egypt, Syria, and Arabia, returning 1826 to Berlin, where he was appointed to one of the medical chairs of the univ., which he occupied until his death. Three years were given to the arrangement and classification of his abundant scientific materials; and to this period belongs the composition of his *Akelephen des Rothen Meeres*, and his *Symbolæ Physicæ*. In 1829, Ehrenberg accompanied Humboldt on an expedition to the Ural and Altai mountains, collecting materials for his numerous memoirs on the Infusoria, and for his great work *Infusionsthierchen*, published at Leipzig, 1838: see Infusoria: Rotatoria. Another work, *Mikrogeologische Studien*, springs from the application of the microscope to geology.

EHRENBREITSTEIN, *ā-rĕn-brīt'stīn* (Honor's Broad Stone): town and fortress of Rhenish Prussia, picturesquely situated on the right bank of the Rhine, directly opposite Coblenz, with which it is connected by a bridge of boats and a magnificent railway bridge of iron. Its trade is in wine and corn. Pop. (1900) 5,302.

The fortress of Ehrenbreitstein occupies the summit of a precipitous rock 370 ft. above the river, and has been called the Gibraltar of the Rhine. On three sides the fortress is so precipitous as to be perfectly inaccessible; on the n.w. it is very strongly fortified, so that with the fortifications of Coblenz, Ehrenbreitstein is one of the most important fortresses of the world. Ehrenbreitstein was besieged in vain by the French 1688, but fell into their hands 1799, after a siege of 14 months. Two years afterward the French, on leaving Ehrenbreitstein, at the

peace of Luneville, blew up the works. It was assigned to Prussia by the Congress of Vienna 1814, and was restored and thoroughly fortified. The view from Ehrenbreitstein along the Rhine and Moselle is very extensive and beautiful.

EHRETIA: see BORAGINEÆ.

EIBENSTOCK, *ī'bĕn-stŏk:* town of Saxony, 16 m. s.s.e. of Zwickau; a centre of lace-making industry. Pop. (1900) 7,468.

EICHHORN, *īch'horn*, JOHANN GOTTFRIED: 1752–1827; b. Franconia: distinguished German scholar. He studied at Göttingen. In 1775, he became prof. of oriental languages in the Univ. of Jena, and 1778 at Göttingen, where he died. His scholarship was almost universal, and he left numerous treatises on a multitude of subjects, both ancient and modern, classical and oriental; but he is known in England and America chiefly as a biblical critic, and a leader of what is called the rationalistic school. Eichhorn examined the Scriptures from an anti-supernatural point of view, but applied to their elucidation and criticism an unrivalled knowledge of oriental and biblical antiquities. He rejected some of the books of the Bible as not genuine, and suggested that the canonical gospels were compiled from older documents. On this subject his suggestions retain extensive influence; but his general system of extreme rationalism in dealing with the records of the Bible can hardly be said now to exist. His works comprise a Library of Biblical Literature, Introductions to the Old Testament, the New Testament, and the Apocrypha; Histories of the Literature of Modern Europe and of Literature generally; a Universal History; and a History of the House of Guelf.

EICHSTÄTT, *īch'stĕt* (earlier *Aichstadt*, Oak-town): town of Bavaria, in a deep valley on the left bank of the Altmühl, about 40 m. w.s.w. of Regensburg. Here is the palace of the Dukes of Leuchtenberg, with a museum; an imposing Gothic cathedral founded 1259; the old town-house; and near it, the ruined Wilibaldsburg on an eminence 1,200 ft. high. There are some manufactures. Eichstatt, which is of Roman origin, became a bishopric 745, was surrounded by Roman walls 908, was cap. of a small principality, and became finally Bavarian 1855. Pop. (1900) 7,703.

EICHWALD, *īch'vâlt*, EDUARD: 1795, July 4—187(Nov.; b. Mitau, Russia: naturalist. He studied at Berlin. He was prof. of zoology successively at Kasan, Wilna, and (1838–57) St. Petersburg. Eichwald investigated the shores of the Caspian Sea, the Caucasus, Persia, Germany, Switzerland, and France, travelled over the greater part of Russia, including the Scandinavian provinces, and in 1840 made a geological journey through Italy, Sicily, and Algeria. His geognostic, botanical, and zoological researches were unquestionably of more service to Russia than those of any man since Pallas. His principal writ-

ings are—*Zoologia Specialis* (Wilna 1829–31); *Plantarum Novarum quas in Itinere Caspio- Caucasico observavit, Fasciculi* (Wilna Leip. 1831–33); *Travels to the Caspian Sea and the Caucasus* (Stuttg. 1834–37); *Memoir on the Mineral Riches of the Western Provinces of Russia* (Wilna 1835); *Palæozoic Russia* (1840); *The Palæontology of Russia* (1851). Other paleontological treatises appeared as late as 1872. Eichwald, who was a member of many learned societies, died at St. Petersburg.

EIDENT, a. *ī'dĕnt* [Icel. *idin*, laborious; *idne*, labor]: in *Scot.*, diligent; steady; busy; continual; other spellings are, ITHAND, YDANT, YTHAND, a. *ī'thănd*.

EIDER, *ī'dĕr:* river of n. Germany, forming the boundary between Schleswig on the n. and Holstein on the south. It rises 12 m. s.w. of Kiel, flows first n.w., then in a general w. direction, though with many windings, and enters the North Sea at Tönning, after a course of about 90 m. It is navigable as far as Rendsburg, from which town the Schleswig-Holstein canal stretches e. to Kiel Fiord, on the shore of the Baltic, thus establishing water communication between the North and Baltic seas.

EIDER, n. *ī'dĕr* [Icel. *ædar;* Sw. *ejder;* Ger. *eider*, an eider-duck]: the down or very fine feathers of a species of duck found in large numbers in Greenland, Iceland, Sweden, etc. EIDER, or EIDER-DUCK (*Somateria*): genus of oceanic ducks, having the hind toe furnished with a deep lobe, and the bill swollen and elevated at the base, and extending up the forehead, where it is divided down the middle by an elongated projection of feathers. The tertials are elongated, and fall down over the wing. This genus is further characterized by the very abundant development of a fine elastic gray down, particularly on the breast, the valuable *Eider-down* of commerce.—The COMMON EIDER (*S. mollissima*) is intermediate in size between a common duck and a goose; not much exceeding the common duck in entire length, because of the comparative shortness of the neck, characteristic of the oceanic ducks, but being about twice its weight. The male is larger than the female; and, in the breeding season, has the under parts black, the upper parts and the neck white, the crown of the head velvety black, the cheeks greenish white. After the breeding season, the white color almost disappears from the upper parts, and gives place to black, without change of feathers. The female is of a pale-brown color, tinged with red, and varied with transverse marks of dark brown. Young males at first resemble the females, and do not acquire the full adult plumage till their third winter. The young are termed Brattocks in many parts of Scotland. The eider is an inhabitant of the n. parts of the world, abounding on arctic and subarctic shores, and becoming rarer in more s. and temperate regions. It is merely an occasional winter visitant in the middle latitudes of Europe, and the Fern Islands are its most southern breeding-place on the British coasts. In N. America, the similar species has been separated under the name *S. dresseri;*

it has no conspicuous difference, and breeds in n. N. America, where hitherto the gathering of the down has been generally neglected; but in Iceland and Norway the breeding-grounds of eiders are carefully protected, and are transmitted as valuable inheritances from father to son. Cattle are sometimes removed from islets, in order to induce the eiders to settle upon them, and a strict watch is kept against dogs and foxes. Promontories are sometimes even formed into artificial islets, on the same account, as the eider, like many other sea-birds, prefer islands for its breeding-places, probably on account of their greater quiet and security. The nest is formed of fine sea-weeds, mosses, and dry twigs, if they are to be had, matted and interlaced. The eggs are usually five, sometimes six or seven in number, about three inches long, and fully two inches broad, of a uniform pale green; they are at first deposited without any down, but as incubation proceeds, the mother strips the down from her breast, and places it about them. By it they are kept warm when she at any time has occasion to leave them, but it seems indispensable to their being hatched; for if the eggs and down are removed, and if this is done a second time, so that the female cannot afford a further supply, the male comes and contributes for the third set of eggs the down of his breast, which is of a paler color. The common practice in Norway and Iceland is to take away the eggs and down twice, leaving the third set of eggs to increase the number of the species. The eiders of the Icelandic and Norwegian breeding-grounds show so little alarm at the approach of visitors, that the females will permit themselves to be touched as they sit on their nests, the males moving about close beside them, but agitated and disturbed. The nests are often placed so close together that great care is necessary in walking among them to avoid trampling upon them. In the Islet of Vidöe, a valuable breeding ground near Reikiavik, the capital of Iceland, almost every little hollow place between the rocks is occupied by the nests of these fowls; they readily take possession of holes cut for them in rows in the sloping side of a hill; nay, garden-walls and the interiors of buildings are in like manner occupied. In Orkney and Shetland the eider is commonly known by the name of Dunter-Duck.

The eider is called sometimes St. Cuthbert's Duck, from a rock called St. Cuthbert's Isle, one of the Fern Islands. It seems probable that, with due care, the number of the eiders at the Fern Islands, and some of the Scottish islands, might be greatly increased, and their down yield a considerable revenue; but at present their eggs are indiscriminately taken with those of other sea-birds, and no protection is extended to them. The eggs are remarkably fine. The flesh of the birds, also, is not unpleasant, and is said to become of superior excellence when they are partially domesticated, and when farinaceous food is mixed in considerable quantity with their natural diet of marine mollusks crustaceans, etc. The

complete domestication of the eider has been successfully attempted, where access could be obtained to the sea.

About half a pound of eiderdown is said to be annually obtained from each nest, but this is reduced by cleaning to a quarter of a pound. The elasticity of the down is such that three-quarters of an ounce of it will fill a large hat, although two or three pounds of it may be pressed into a ball and held in the hand. Its extensive use, particularly in Germany and other parts of the continent of Europe, for stuffing the bed-coverings, which there usually supply the place of blankets, etc., is well known. The down taken from birds which have been killed is inferior in quality to that obtained from the nests. The latter is known in commerce as *live down*, the former as *dead down*.

The KING EIDER, or KING DUCK (*S. spectabilis*), also yields no inconsiderable part of the eiderdown of commerce, especially of that which is brought from the Danish towns in Greenland. This bird is circumpolar, and in winter occurs sometimes s. to New York. Its squarish frontal processes bulge angularly out of line with the ridge of the bill.—Three other species are found on our Northwest coast: STELLER'S EIDER (*S. stelleri*), with a violet speculum, and the bill (without frontal process) not feathered to the nostrils; the SPECTACLED EIDER (*S. fischeri*), with black-bordered, puffy, white feathers around the eye; and the PACIFIC EIDER (*S. v-nigrum*) of the arctic and n. Pacific coast, perhaps only a variety of *S. mollissima*, like it and the King eider, with a forked throat-patch. Skins of king ducks are made into winter garments by the inhabitants of Siberia and Kamtchatka.

EIDLITZ, *īd'lĭts*, LEOPOLD: architect: b. Prague, 1823, Mar. 29. He was educated in Prague and Vienna; engaged in business as an architect in New York; and designed Christ Church, St. Louis; St. George's Church, New York; Acad. of Music, Brooklyn; and the Dry Dock and Continental bank buildings, New York; and prepared plans for the completion of the Capitol, Albany. His son, CYRUS LAZELLE WARNER EIDLITZ, architect, b. New York, 1853, July 27, was educated in the United States and abroad, and designed the Michigan Central railroad depot, Detroit (1880); the Dearborn depot, Chicago (1883), and the Public Library, Buffalo (1888).

EIDOGRAPH, n. *ī'do-graf* [Gr. *eidos*, form, appearance; *graphō*, write, I draw]: instrument for copying drawing, invented by Prof. Wallace.

EIDOLON, n. *ī-dō'lŏn* [Gr. *eidōlon*—from *eidos*, that which is seen; likeness]: image, likeness, or representation; an apparition; an appearance.

EIDOSCOPE, n. *ī'do-skōp* [Gr. *eidos*, form, appearance; *skopeō*, I see]: instrument on the principle of the kaleidoscope, which produces an infinite variety of geometrical figures by the independent revolution of two perforated metallic disks on their axes.

THE EIFFEL TOWER.

EIDOURANION, n. *ī-dow-rā′nĭ-ŏn* [Gr. *eidos*, form, appearance, and *ouranos*, the heaven]: representation of the heavens.

EIFEL, n. *ī′fĕl:* a district on the lower Rhine celebrated in geology for its recent volcanic rocks, its brown coal, and other deposits, and for its fossils.

EIFFEL TOWER, *ī′fel:* designed by Gustave Eiffel, French engineer, b. Dijon, 1843, designer and builder of the Bordeaux bridge, Garabit viaduct, and other great engineering works; erected in the Champs de Mars, Paris, in connection with the international exhibition 1889. The form of the tower is that of a square of four arches, sloping inward and upward to a platform from which rises an airy, graceful column of open ironwork, from four feet, sloping somewhat like a lighthouse, and terminating in a small domed apartment, displaying the French flag in daytime and a powerful electric light at night. It is 984 ft. high, and cost $1,300,000, to which the govt. contributed $300,000, the remainder being furnished by an incorporated company, authorized to operate it for 20 years, after which it becomes the property of the state. Its great height will be best realized by comparison with other well-known structures, viz.: Washington monument, 555 ft.; City Hall, Philadelphia, 535; Cologne Cathedral, 511; St. Stephen's Cathedral, Vienna, 470; Strasburg Cathedral, 468; Great Pyramid, 450; St. Peter's Cathedral, Rome, 448; St. Paul's Cathedral, London, 404; and Bartholdi's Statue of Liberty, 329. The work of constructing the tower began 1887, Jan. 28; more than 5 months were occupied in laying the foundations; work on the iron superstructure was begun June 30; the second platform was reached 1888, July 14; and the whole was completed 1889, April. The limit of vision from the top of the tower in clear weather is 40 m., which takes in Fontainebleau, Mantes, and Pontoise. The tower was fitted with American elevators, of novel shape and construction. The great work proved to be almost the chief attraction of the exhibition, and the receipts from its patrons during the time of the exhibition amounted to its cost, less a few francs. Though constructed with the primary object of showing to the world what French engineers could do, the designer had the ultimate object of providing a durable and exceptional meteorological station. As the tower was projected for a permanent structure, it will enable scientists to study the decrease of temperature at different heights, observe the variations of the wind at hitherto inaccessible points, discover the quantity of rainfall and the density of the clouds at various altitudes, and to study the laws of refraction and the physical aspect of the moon, planets, and nebulæ under most favorable conditions.

EIGHT, n. *āt* [Icel. *átta;* Skr. *astan;* L. *octo;* Goth. *ahtau;* Ger. *acht;* AS. *eahta*, eight]: twice four; four and four. EIGHTEEN, n. *ā′tēn* [*eight* and *ten*]: twice nine; eight and ten. EIGHTEENTH, a. *ā′tēnth*, after seventeenth.

EIGH'TEEN'MO, n. [*mo*, the added termination of L. *dĕcĭmŏ: ten* and *eighteen*]: a size of a book; a sheet formed into eighteen leaves: see PAPER. EIGHT-FOIL, in *heraldry*, a grass having eight leaves, as the trefoil has three. EIGHT'-FOLD, a. eight times the number or quantity. EIGHTH, a. *āth*, next after seventh: *N.* a musical interval of five tones and two semitones. EIGHTHLY, ad. *āth'lĭ*. EIGHTY, n. or a. *ā'tĭ* [AS. *eahta*, eight; *tig*, a collection of *tens*—the termination *teen* indicating addition, and *ty* multiplication]: eight times ten. EIGHTIETH, a. *ā'tĭ-ĕth*, next after seventy-ninth. EIGHT'SCORE, n. eight times twenty: see SCORE. PIECE OF EIGHT, former popular name of the Spanish dollar, as worth eight reals.

EIGHT-HOUR DAY. In the struggle for the shortest hours of labor compatible with the highest efficiency, begun in Great Britain early in the 19th century, the first great landmark was the Ten Hours' Bill of 1847, enforcing in all trades what had come about in many. But the golden ideal since 1824 (announced as such by Robert Owen in 1817) has been eight hours; possibly in remembrance that such was the rule in mediæval England; partly perhaps from the tempting threefold division of the day into equal parts, as in the rhyme 'Eight hours for work, eight hours for play, eight hours for sleep, eight *bob* a day.' The eight-hour day was won in Australia in 1858. The movement on the Continent dates from the foundation of the 'International' in 1864, and as a world-demand of the social reformers, from the Paris Trades-Union Congress of 1883. In the United States, till recently the subject was left to the States and to private contests, the government aiding by making short hours in its own works. In 1840 President Van Buren reduced the working day in the government navy yards to 10 hours. The first state 10-hour law, for textile workers only, was of 1849, in Pennsylvania. The first Massachusetts law was in 1874, and was due largely to the 'Knights of St. Crispin.' But the eight-hour movement had long before become general: in 1866 the demand was formulated at a general workingmen's congress at Baltimore, and at other meetings; and the National Labor Union was organized to secure an eight-hour day. A six weeks' strike in New England and New York, April-May 1866, attempted to secure it, but failed. In 1867 Connecticut and Illinois passed laws making eight hours a legal day 'unless otherwise agreed.' Pennsylvania followed in 1868 and New York in 1870. On 1869, June 24, the United States enacted an eight-hour day for its establishments; but the managers reduced wages correspondingly, allowing those who wished to work 10 hours at the old wages, which aroused such wrath that the President revoked the order. All these laws were rendered nugatory by the contracting-out clauses. In 1872 eight-hour leagues were formed in various places, and in Connecticut and New York a mass of strikes among the wood-working trades won this goal for a while; but the great

depression from 1873 on prevented pressing such questions. Since 1880 several states have enacted the eight-hour law under the above conditions. But the first great concerted effort for eight hours was in 1886, when 200,000 workmen went on strike; it was at an eight-hour meeting in Haymarket Square, Chicago, that the anarchist bomb was thrown. A general strike was announced for this object in 1890, but was only partially successful, several hundred thousand workmen struck, and many employers yielded, but soon advanced the hours. The first really efficient national law was of 1892, Aug 1, enforcing eight hours upon all laborers, mechanics, or contractors in the District of Columbia, under pain of fine and imprisonment. The short-hours' movement was first begun to protect women and children, the men sharing incidentally. It may be added that the practical results of the system are almost universally favorable. The eight-hour day in the United States now prevails in several important industries, notably building construction, iron and steel industries, marble and stone work, newspaper printing and publishing, ship-building and cigar making. From 1906, Jan. 1, eight-hours became the standard of the Typographical Union. The coal-mining districts have also adopted it to a great extent. See Webb and Cox, *The Eight-Hour Day* (1891); Rae, *Eight Hours for Work* (1894).

EIGHT-HOUR LAW, an act adopted in 1868 by the United States Congress, providing that in all government employment eight hours shall constitute a day's work. It originated in the agitation which had begun in England in 1833 by the proposition of eight hours as a legitimate working day. The agitation spread itself among the industrial classes throughout the civilized world, and first bore fruit in Australia in 1856, where it was adopted by several trades. The National Labor Union of the United States demanded it in 1866, and it came into effect in the government navy yards in 1869, and shortly afterward in all departments of government work. Its universal adoption, however, is still unrealized, and it is the source of persistent agitation among the labor organizations and parties throughout the United States, the British Empire, and on the continent of Europe. Consult: Rae, *Eight Hours for Work* (1894).

EIK, *ēk:* in the legal phraseology of Scotland, addition made to a document for the purpose of meeting circumstances which have subsequently arisen.

EIKON BASILIKÉ, *ī'kon ba-sĭl'ĭ-kē* (Likeness of a King): a work formerly presumed to have been written by Charles I. during his confinement, but now more correctly imputed to another writer. The following are the explanations of M. Guizot on the subject, in his *History of Oliver Cromwell and the English Commonwealth.* 'It is to the *Eikon Basilikė* that Charles I. is principally indebted for the name of the Royal Martyr. The work is not by

him; external testimony and internal evidence both combine to remove all doubt on the matter. Dr. Gauden, bp., first of Exeter and afterward of Worcester, under the reign of Charles II., was its real author; but the manuscript had probably been perused and approved, perhaps even corrected, by Charles himself during his residence in the Isle of Wight. In any case, it was the real expression and true portraiture of his position, character, and mind, as they had been formed by misfortune; it is remarkable for an elevation of thought which is at once natural and strained; a constant mingling of blind royal pride and sincere Christian humility; heart-impulses struggling against habits of obstinate self-consciousness; true piety in the midst of misguided conduct; invincible, though somewhat inert devotion to his faith, his honor, and his rank; and as all these sentiments are expressed in monotonous language, which, though often emphatic, is always grave, tranquil, and even unctuous, with serenity and sadness, it is not surprising that such a work should have profoundly affected all royalist hearts, and easily persuaded them that it was the king himself who addressed them.' The view that Charles was the author is, however, still maintained by some. See new editions of the *Eikon Basilikê* 1880 by Scott and Phillimore; and the *Athenæum* of 1880. See GAUDEN, JOHN.

EILDON HILLS, *ēl'don:* isolated range, with three conical summits, near Melrose, Roxburghshire, Scotland. The central peak, 1,385 ft. high, commands a very wide and impressive view. See RHYMER.

EILENBURG, *ī'lĕn-bûrg:* town of Prussian Saxony, on an island in the river Mulde, 26 m. e.n.e. of Merseburg. The manufactures of Eilenburg consist of calico, woolen yarn, tobacco, chemicals, beer, and agricultural implements. Pop. (1905) 15,721.

EILETHY'IA: city of Egypt, anciently Nuben, and known at present by the name of El Kab. The town was anciently walled. The present ruins consist of the remains of small temples dedicated by Rameses II. to Ra; a Ptolemaic temple dedicated to the Eponymous goddess by Physcon or Euergetes II., with additions by Ptolemy Alexander I., and Cleopatra; and another temple dedicated by Amenophis III. to the local deities. The names of other monarchs are also found in the ruins; but the most interesting and important remains are the rock-tombs excavated in the vicinity. That of Aahmes-Pensuben, a functionary, records his military services in the wars of the early monarchs of the 18th dynasty against the Shos or Shepherds, and other Asiatic and Nigritic races. Another, of Pahri, is decorated with paintings representing the pursuits of agriculture. Swine were sacred to the local goddess. The town itself, during the 18th dynasty, appears to have been governed by princes, and some of the tombs appear as late as the 19th and 20th dynasties.

EIMBECK, *īm′bĕk*, or EINBECK, *īn′bĕk:* old town of Hanover, on the Ilme, 40 m. s.s.e. from Hanover; lat. 51° 49′ n., long. 9° 50′ e. It was a place of considerable importance in the 15th c., and was a Hanse city, but has decayed greatly in recent times. The minster is large and beautiful. The houses of Eimbeck are antiquated; its streets narrow, tortuous, and badly paved. One portion of the town, however, burned down in 1826, has been rebuilt in a greatly improved manner. Eimbeck has manufactures of woolens, cottons, and linens, and chemical products; and has distilleries, breweries, tanneries, and tobacco-factories. Eimbeck owes its origin to the pilgrimages made to the Chapel of the Holy Blood, founded here 1080, by Count Alexander von Darul. Pop. (1900) 7,914.

EIMEO, *ī′mē-ō:* one of the Society Islands, in the Pacific Ocean, lat. 17° 30′ s., and long. 150° 10′ w., about 30 m. w.n.w. of Tahiti, the principal member of the group. It measures nine miles by five, and consists of deep valleys and abrupt hills—the former well cultivated, the latter heavily timbered. It is worthy of notice chiefly as the cradle of Polynesian Christianity. Here, in or about 1814, occurred the first popular manifestation in favor of the new religion; and here was established, as an instrument of evangelization, the South Sea College of the London Missionary Society. Pop. abt. 1,500.

EINSIEDELN, *īn′zē-dĕln:* small town of Switzerland, in the canton of Schwytz, 9 m. n.n.e. of the town of Schwytz. It is notable for its Benedictine Abbey, containing a black image of the Virgin, to which about 150,000 pilgrims annually repair. The town has 55 inns and 20 ale-houses, supported chiefly by the pilgrims. The dedication festival of the abbey, Sep. 14, is the great pilgrimage season. The present abbey, one of the finest in Switzerland, was built at the beginning of the 18th c., and is the fifth since the foundation of the abbey, in the 10th c. Its treasury was rifled by the French 1798. Pop. (1900) 8,496.

EIRE, or EYRE, *ār*, JUSTICES IN: (corruption of Lat. *in itinere*). By this term, both in England and Scotland, were the judges of assize (q.v.) formerly designated. Justices in eire were first established in England by the statute of Northampton (1176), in the reign of Henry II. At first they made the circuit of the kingdom once in seven years; but by Magna Charta, c 12, the chief-justices are directed to send justices through every county once in the year.

EISEL, n. *ē′sĕl* or *ī′sĕl* [AS. *eisile;* OF. *aisil*, vinegar]: in *OE.*, wormwood wine; vinegar; any acid.

EISENACH, *ī′zĕn-ach:* town of Germany, Saxe-Weimar, beautifully situated amid finely wooded hills on the Hörsel, 45 m. w. from Weimar. Once the cap. of a principality to which it gave name, Eisenach is still prosperous and industrious, and is well built, with wide, clean,

and well-paved streets. Eisenbach has a ducal palace, a large and handsome building, now used as a court house; a spacious market-place, including a handsome civic school; numerous churches; and a school of design. Its manufactures are woolen, cotton, and linen goods, soap, white-lead, meerschaum pipe bowls, leather, and carpets; there are also breweries and tanneries, and oil, powder, and spinning-mills. Pop. (1900) 31,580.

On a lofty eminence in the immediate vicinity, surrounded by forests, and finely restored since 1847, stands the castle of Wartburg, former residence of the landgraves of Thuringia, and noted as the spot where the Minnesingers (q.v.) assembled to hold a trial of skill 1207, but chiefly as being the asylum to which Luther, at a time of great danger, was carried by his friend the Elector of Saxony, who, waylaying the great reformer, seized him, with an appearance of violence, and hurried him to this fastness, where he remained in safety, 1521, May—1522, March. The chapel in which Luther preached, as well as the chamber which he inhabited, and in which he discomfited the Evil One by throwing the inkstand at his head, is still pointed out. Another portion of the castle contains a fine armory, with suits of the 16th and 17th, and even, it is said, of the 13th and 14th c.

EISENBERG *ī'zĕn-bĕrch* (Ger. Iron Mountain): small town of Germany, in the duchy of Saxe-Altenburg, on an eminence near the Saale, 26 m. of Weimar. It is well built, its chief edifices being the castle, the observatory, the lyceum, and the town-house. Eisenberg has manufactures of woolens, porcelain, and earthenware, and has five annual fairs. Pop. (1900) 8,964.

EISENERZ, *ī'zĕn-ĕrts:* small town of Austria, in the n. of the province of Styria, 20 m. w.n.w. of Bruck. Its appearance is dirty and unprepossessing, and it is notable only for its connection with the Erzberg (ore mountain), at the s. base of which the town lies. This mountain, about 5,000 ft. high, and about five miles in circumference at the base, is literally a solid mass of iron ore, of a quality so rich, that, instead of cutting mines into it and following the metal in veins—which process was formerly adopted here—the top and sides of the rock are quarried from the outside, and the ore is then broken small, and conveyed to the smelting-house without further preparation. Mines have been worked on this mountain for upward of 1,000 years. Arragonite (*Eisenblüte*, or *Flos ferri*), resembling branching coral in form, and of the most beautiful and purest white, is found in grottoes in the interior of the mountain. Nowhere else does it occur in equal perfection. Pop. (1900) 6,494.

EISENSTADT, *ī'zĕn-stât:* free town of e. Hungary; lat. 47° 50′ n., and long. 16° 30′ e., 12 m. n.n.w. of Oedenburg, It is walled, has two gates, and consists principally of three main streets. It has also a Franciscan monastery, containing the burial-vault of the Esterhazy family.

proprietors of the palace which is the chief architectural feature of Eisenstadt; built 1683, altered and enlarged 1805. It contains 200 chambers for guests, and has a saloon sufficiently large to dine 1,000 people. Its library contains a magnificent collection of church-music—masses, litanies, oratorios, etc., with some of Handel's MSS. In the suburbs is a conservatory, one of the largest in Europe, containing 70,000 specimens of exotic plants. The Magyar name of Eisenstadt is *Kis-Marton*. Pop. (1900) 2,000.

EISLEBEN, *īs'lā-bėn:* town of Prussian Saxony, about 20 m. w. of Halle. Eisleben, once cap. of the counts of Mansfield, is the centre of a rich mining district, and consists of old town, new town, and suburbs. Eisleben makes large quantities of beer, and has manufactories of potash and tobacco; in the vicinity are copper and silver mines, producing yearly about 1,000 tons of copper, and 25 tons of silver. Pop. (1890) 23,897, (1905) 25,120. Here, 1483, Nov. 10, Luther was born, and here also he died, 1546, Feb. 16. The house in which he was born was partially consumed by fire 1689, but a remnant of it is extant, having the portrait of Luther over the entrance. In 1883, 400th anniversary of Luther's birth, a bronze statue of him was erected and a new gymnasium opened.

EISTEDDFODD, n. *ĭs-tĕth'vōd* [W.—from *eistedd*, to sit; *bod*, in composition; *fod*, to be]: in *Wales*, a congress of bards, minstrels, and *literati*, for competition in national minstrelsy: see BARD: WELSH LANGUAGE AND LITERATURE.

EITHER, a. *ē'ther* [AS. *ægther*, any one of two—the prefix *æg* in composition signifying ever, always: Dut. *ieder*, every, each: comp. Esthon. *igga;* Lap. *ikke*, ever, all]: one of two; one or the other: CONJ. introductory word or correlative to *or*—as, he is *either* a rogue *or* a fool.

EJACULATE, v. *ĕ-jăk'ū-lāt* [L. *ejacŭlātus*, cast or thrown out—from *ex*, out of; *jăcŭlor*, I throw or dart; *jăcŭlum*, a javelin, a dart]: to utter a few words suddenly, as a prayer; to exclaim earnestly but briefly. EJAC'ULATING, imp. EJAC'ULATED, pp. EJAC'ULA'TION, n. *-lā'shŭn* [F.—L.]: the uttering of a short prayer; the prayer itself; a short sudden exclamation. EJAC'ULA'TORY, a. *-lā'tėr-ĭ*, suddenly spoken or uttered in short sentences.

EJECT, v. *ĕ-jĕkt'* [L. *ejectus*, cast out, expelled—from *ex*, out of; *jăcĭō*, I throw]: to cast or throw out; to void; to discharge; to evacuate; to turn out; to dismiss from an office; to expel. EJEC'TING, imp. EJEC'TED, pp. EJEC'TOR, n. *-tėr*, one who. EJEC'TION, n. *-jĕk'shŭn*, the act of throwing or casting out; expulsion. EJECT'MENT, n. *-jĕkt'mĕnt*, a dispossession; in *law*, a writ for the recovery of possession of land.

EJECT'MENT, ACTION OF (*Ejectio firmæ*), in Law: 'a possessory action, wherein the title to lands and tenements may be tried, and the possession recovered, in all cases where the party claiming title has a right of entry.'—Sel-

wyn's *Nisi Prius*. 'The action of ejectment,' says Lord Mansfield, 'is the creature of Westminster Hall, introduced within time of memory, and molded gradually into a course of practice by rules of the courts.' According to the strict rules of common law, a person dispossessed of his property in land, etc., was obliged to enforce his right by one of the forms of real action (q.v.) now abolished. This process being tedious, the action of ejectment was adopted for establishing title to land, and a marvellous line of legal fictions was in use through several centuries. In 1852 all these were swept away. The action now commences by a simple writ addressed to the tenant in possession, and 'to all persons entitled to defend the possession,' setting forth that the plaintiff has asserted a claim to the land, and calling upon those interested to appear within a certain time to defend their right. The writ also contains a notice that, in default of appearance, the tenant in possession will be ejected. On appearance being made, issue is joined, and the cause proceeds as in ordinary actions. Judgment in ejectment will not carry the mesne profits or rents. In some cases of forcible entry, justices of the peace can also summarily eject the intruder and give possession. See EVICTION.

In the United States—at least in some of the states—action for ejectment follows the present English procedure, which, however, cannot be called English precedent, as in N. Y. the basis laid by the reform in England, 1852, was established 1830. Though judgment in ejectment does not carry recovery of the profits or rents, it supplies cause for another action by plaintiff (action of trespass for intermediate profits) for such recovery. In some states the two causes may be joined in one action at law.

E'JOO: see GOMUTO.

EJUTLA, *ā-chût'lâ:* town of Mexico, province of Oajaca, 250 m. s.s.e. of Mexico city. Pop. 7,500.

EKATERINBURG, *ā-kâ-tā-rēn-bûrg':* fortified town of Russia, province of Perm, on the e. slope of the Ural Mountains, on both banks of the Isset; lat. 56° 50′ n., long. 60° 7 e. It is well-built, its streets long and straight, but unpaved, though having plank footpaths. The majority of the houses are of wood, but there are also many very handsome stone buildings. In the s. portion of the town, connected with the n. by a fine bridge, are the govt. magazines, the mills, factories, and the market-place. The opposite side, however, is the handsomer. It contains the dwellings of the mine-proprietors and of the merchants, and is laid out in elegant and spacious streets. Ekaterinburg is the seat of administration for the Ural mines, and is in the centre of the mining districts of these mountains. It has a museum of mineralogy, an excellent chemical laboratory, a school for educating miners, an imperial mint, numerous works for cleansing and amalgamating metals, and for cutting and polishing precious stones. The greater number of the inhabitants are supported by the productiveness

of the neighboring mines. Ekaterinburg stands on the high road between Russia and Siberia, and is therefore a place of brisk trade. In the vicinity are the gold mines of Niviansk and Beresoff. Ekaterinburg was founded by Peter the Great 1723. Its average temperature during the year is 31° 9′. Pop. 55,488.

EKATERINODAR, *ā-kâ-tā-rē-nō-dâr′:* town of Russia cap. of the country of the Cossacks of the Black Sea, on the right bank of the river Kuban, about 100 m. from its mouth; lat. 45° 5′ n., long. 39° e. It is surrounded on all sides by swamp and morass. Its houses are almost all of earth, have thatched roofs, and are of one story in height. The streets are broad, regular, and straight, but exceedingly dirty. Ekaterinodar has a cathedral with 6 wooden towers, and a wooden fortress. Pop. 65,697.

EKATERINOGRAD, *ā-kâ-tā-rē-nō-grâd′:* town and fortress in the s. of Russia, in the govt. of Caucasus; on the left bank of the Terek; lat. 43° 40′ n., and long 44° 3′ e. It is an important military post of the Cossacks; its houses are regular, but miserably built. A stone triumphal arch was erected at Ekaterinograd by Catharine II., in memory of Prince Potemkin, who founded the town, 1777. Pheasants abound here, and form a principal article of food. Pop. about 3,000.

EKATERINOSLAV, *ā-kâ-tā-rē-nō-slâv′:* government in Russia, province of s. Russia, bounded on the n. by Little Russia, and on the s.; reaching in one part to the shores of the Sea of Azov. Ekaterinoslav, with that isolated portion of it which lies on the e. border of the Sea of Azov, and comprises the dist. of Taganrog and the country of the Azovian Cossacks, has, in all, 26,050 sq. m. Only about one-third of the entire area is cultivable, the remainder being desert (see STEPPE). The climate is mild, and a great many highly esteemed fruits, as apricots, peaches, cherries, etc., which do not occur in the more n. parts of Russia, are found here. Ekaterinoslav has deep and extensive beds of coal. Though in 1870 not more than fifty tons were raised, the quantity within three or four years increased to many thousand tons annually. Pop. 2,112,652.

EKATERINOSLAV: fortified town of s. Russia, on the right bank of the Dnieper, 250 m. n.e. from Odessa; lat. 48° 27′ n., long. 35° 5′ e. It was founded 1787 by Empress Catharine II. The streets are long and broad, but not clean. Ekaterinoslav has manufactures of silk and woolen goods, and an important annual wool-fair. It is the residence of an archbishop. In the vicinity is a palace, now in ruinous condition, formerly the residence of Prince Potemkin. Pop. 121,216.

EKE, v. *ēk* [Goth. *auk;* Icel. *og;* Ger. *auch*, also: AS. *écan;* Goth. *aukan;* Icel. *auka*, to eke, to augment: L. *augĕrĕ*, to increase]: to add to; to enlarge; to lengthen; to protract; to spin out: AD. likewise; in addition; also, E′KING, imp.: N. increase. EKED, pp. *ēkt.*

EKEBERGIA, n. *ĕk-ĕ-bĕr′jĭ-a* [named by the African traveller Sparmann, after his relative, Capt. C. Gustavus *Ekeberg*, a Swedish captain, who took him to China]: in *bot.*, genus of plants, order *Meliaceæ*, tribe *Trichilieæ*. *E. capensis* is a very ornamental tree about 20 ft. high, sometimes cultivated in greenhouses.

EKEBERGITE, n. *ĕk′ĕ-bĕr-jīt* [named 1824 after *Ekeberg*, who analyzed it 1807]: tetragonal, transparent, or translucent mineral; found in Sweden, Norway, Finland, and N. Y. Two varieties of it are passauite and paralogite. The *British Museum Catalogue* reduces Ekebergite to a variety of scapolite (q.v.), while Dana uses scapolite in a more extensive sense for a group of minerals.

EKHMIN, *ĕch-mēn′*, or AKHMIM, *âċh-mēm′:* town of Upper Egypt, near the right bank of the Nile, on the site of the ancient *Chemmis*, or *Panopolis*, one of the great cities of the Thebaid. Remains of ancient buildings are found. Pop. 4,000.

EKMANITE, n. *ĕk-man′īt* [Ger. *ekmanit:* named after G. *Ekmann*, proprietor of the mine in which it was found]: a Swedish mineral of the chlorite group.

EKRON, *ĕk′ron:* one of the 5 cities of Philistia; Judah's portion of the territory distributed by Joshua; in the s. part of Palestine; 10 m. e. of the Mediterranean, 15 m. s.e. of Jaffa, 25 m. n.w. of Jerusalem; near the right bank of the Wady-es-Surar. Beelzebub was openly worshipped there, its inhabitants were denounced severely by the prophets, and the ark was taken there after its capture by the Philistines. The ancient city is supposed to have been built with unburnt bricks, and its site is now occupied by the town of Akir or Akree.

ELABORATE, v. *ĕ-lăb′ō-rāt* [L. *elabōrātus*, labored, taken pains with—from *ex*, out; *labōrŏ*, I toil: It. *elaborare:* F. *élaborer*]: to improve or highly finish by successive operations: ADJ. highly finished; complicated. ELAB′ORATING, imp. ELAB′ORATED, pp. produced with labor or study. ELAB′ORATELY, ad. *-lĭ*. ELAB′ORATENESS, n., or ELAB′ORA′TION, n. *-rā′shŭn* [F.—L.]: the act of finishing with great care; the improvement which results from this care. ELAB′ORA′TOR, n. *-tĕr*, one who.—SYN. of 'elaborate, a.': high-wrought; labored; prepared; studied; perfected.

ELÆAGIA, n. *ĕl-ē-ăj′ĭ-a* [Gr. *elaia*, the olive tree, and *hagios*, devoted to the gods, sacred]: in *bot.*, genus of *Cinchonaceæ*. *E. utilis*, is the wax or varnish tree of the Cordilleras.

ELÆAGNUS, *ĕl-ē-ăg′nŭs:* genus of exogenous plants, of the nat. ord. *Elæagnaceæ*. This order consists of trees and shrubs, usually covered with scurfy scales. The Buffalo Berry (*Shepherdia argentea*) of the upper Missouri region, 12–18 ft. high, with 8-stamened flowers, has leaves with silvery scales, and small, scarlet, well-flavored fruit. *S. canadensis*, also thorny, a fine shrub, has stellate hairs.

The Silver Berry (*E. argentea*), Vt. to Wis. and n., is a beautiful shrub, with reddish branches and silvery leaves, having rusty scales. The Sallowthorn (q.v.) is the only British species. *E. angustifolia*, the Oleaster, sometimes called Wild Olive, is a native of the s. of Europe and the Levant, a spiny tree 15–20 ft. in height, with lanceolate leaves, which, as well as the young shoots, are hoary with stellate hairs. It is planted in some more northern countries for its silvery white foliage, beautifully contrasting with the green of other trees, and its very fragrant flowers, which are small and of a dull yellow color.

ELÆ'IS: see Oil Palm.

ELÆOCARPACEÆ, *ĕl-ē-ō-kâr-pā'sē-ē:* according to some botanists, a nat. ord. of exogenous plants, but regarded by others as merely a sub-order of *Tiliaceæ*, the chief distinctions being deeply cut or fringed petals and anthers opening at the apex. The Elæocarpaceæ are mostly E. Indian trees. The fruits of some are eaten; those of some are dried and put into curries; those of *Elæocarpus serratus* are pickled in brine and eaten with oil in Ceylon, and much resemble olives. *E. cyaneus*, is a native of New Holland. The deeply wrinkled seeds or stones of the fruit of some, particularly *Elæocarpus ganitrus* and *Monocera tuberculata*, being very hard, and having a fine sculptured appearance, are made into beads for necklaces and bracelets, and are sometimes set in gold. They are called often Olive Nuts. These beads are frequently worn by religious devotees in India, and sometimes sold as ornaments in the shops of Europe.

ELÆOCOCCA, *ĕl-ē-ō-kŏk'ka:* genus of *Euphorbiaceæ*, the seeds of some of which yield useful oils. The oil obtained from *E. verrucosa* is used for food in Japan, notwithstanding considerable acridity. The tree is cultivated in the Mauritius, and the oil is there used only for burning. That obtained from *E. vernicia* is used in painting in China.

ELÆODENDRON, *ĕl-ē-ō-dĕn'dron:* genus of trees of the nat. ord. *Celastraceæ*, having a 5-partite calyx, 5 petals, a 5-angled disk, 5 stamens, the ovary immersed in the disk, and a drupaceous fruit. *E. glaucum*, native of Ceylon and the s. of India, is called sometimes the *Ceylon Tea-tree*, from the resemblance of its leaves to those of the tea-shrub. The timber of *E. croceum*, called Saffron-wood at the Cape of Good Hope, is much used there in building and cabinet-making; it is fine-grained, hard, and tough. The fruit of *E. Kubu*, another s. African species, is eaten by the colonists. That of *E. Argan* yields an oil similar to olive oil, much used by the Moors.

ELÆOLITE, n. *ē-lē'ō-līt* [Gr. *elaion*, oil; *lithos*, a stone]: a mineral of the scapolite family having a fatty resinous lustre.

ELÆOSELINUM, n. *ĕl-ē-ŏ-sĕ-lī'nŭm* [Gr. *elaia*, the olive, and *selinon*, a kind of parsley]: in *bot.*, genus of *Apiaceæ*, typical of the family *Elæoselinidæ*.

ELAGABALUS, *ĕl-a-găb′a-lŭs* or *ĕl-a-ga-bā′lŭs*, or HELIOGABALUS, *hē-lĭ-ō-găb′a-lŭs* or *hē-lĭ-ō-ga-bā′lŭs*, Emperor of Rome: 204–222 (reigned 218–222); b. Emesa. His real name was Varius Avitus Bassianus, but having, when a mere child, been appointed high-priest of the Syro-Phenician sun-god Elagabal, he assumed the name of that deity. Soon after the death of his cousin Caracalla, Elagabalus was proclaimed emperor by the soldiers in opposition to the legitimate sovereign, Macrinus, who had become obnoxious to the troops from the severity of his discipline. The rivals met in battle at Antioch in 218. Macrinus was defeated, and Elagabalus quietly assumed the purple. His reign, which lasted rather more than three years and nine months, was infamous for the nearly unparallelled debaucheries of every kind in which he indulged. He was murdered in an insurrection of the prætorians and was succeeded by his cousin and adopted son, Alexander Severus.

ELAINE, or ELAIN, n. *ē-lā′ĭn* [Gr. *elaion*, oil]: the liquid principle of oils and fats; a fat oil which remains liquid at ordinary temperatures—usually OLEINE, *ŏ-lē′ĭn* (q.v.).

ELAM, *ē′lam*, or SUSIANA, *sô-sĭ-â′nâ:* part of the ancient empire of Persia, between Diyaleh river and the Persian Gulf on the n. and s., and the Kebir Kuh range of mountains and the Tigris river on the w. and e. The country is mountainous in the n., flat in the s., and marshy along the gulf coast, and the inhabitants are now as formerly nomadic in their habits. It is computed from cuneiform inscriptions that the Elamite dynasty was established in Chaldea about B.C. 2295. The Assyrian kings were continually at war with the people of Elam, who sought to establish their own independence. One king of Elam conquered Babylonia, and 9 kings are mentioned in the inscriptions. The cap. was Shushan or Susa.

ÉLAN, n. *ā-lâng′* [F.]: a start; a leap; a bound; buoyancy of spirit.

ELAND, n. *ē′lănd* [Dut. *eland;* Ger. *elend;* the elk], (*Antilope Oreas*): largest species of antelope in south Africa, abounding wherever there are fertile plains and low hills, except in the longest settled and most cultivated parts of Cape Colony, where it has been too much hunted to be any longer abundant. It is described by Livingstone as 'the most magnificent of all antelopes.' It is one of those called sometimes *bovine* antelopes, because they seem to approximate in some of their characters to the ox-tribe, having a broader muzzle, less slender limbs, and greater bulkiness of form than the antelopes in general. The eland, however, is very graceful and beautiful; it is as large as a horse, fully five ft. in height at the shoulder, and weighs from seven to nine cwt. The horns—in the male about a foot and a half long, and in the female longer and more slender—are almost straight, inclining backward and outward; they are pointed, and their great strength is

increased by a spiral wreath. The eland has a large protuberance on the larynx, in this resembling the elk, from which, probably, on this account, it has derived its name. It is known also as the *Impoof* or *Impoofoo*. Its tail much resembles that of an ox, and terminates in a tuft of long black hair. It is gregarious and the herds are often large. It is generally very fat, and not difficult of pursuit, its gentleness also increasing the facilities of the hunter. Its flesh is much esteemed, particularly the muscles of the thighs, which are dried like tongues. It is surprising that no attempt has been made to domesticate for useful purposes an animal very easy of domestication, and with so many valuable qualities.

Livingstone discovered a variety of the eland in regions n. of the Cape Colony, having the body marked with narrow white transverse bands. According to the figure given in his travels, it seems even more bovine in form than the common variety.

ELANET, *ē-lā′nĕt* or *ĕl′a-nĕt* (*Elanus*): genus of *Falconidæ*, allied to the kites, which they resemble in many of their characters; but from which they differ in having the short tarsi half covered with feathers, and the claws, except that of the middle toe, rounded beneath. The tail is very little forked. One species (*E. melanopterus*) is common in Africa, from Egypt to the Cape of Good Hope, and is found also in India. Another species is the Black-shouldered Hawk (*E. dispar*) of America, the n. limit of which appears to be S. Car. Both of these feed chiefly on insects, which they catch on the wing, but they prey also on small birds and reptiles.

ELAPHOMYCES, n. *ĕl-a-fō′mĭ-sēz* [Gr. *elaphos*, a deer]: genus of ascomycetous fungi.

ELAPHRIUM, n. *ĕ-lā′frĭ-ŭm* [Gr. *elaphria*, lightness]: genus of *Amyridaceæ*. *E. tomentosum*, has been said to furnish the balsamic bitter resin called Tacamahac; family *Burseridæ*.

ELAPHRUS, n. *ĕl′a-frŭs* [Gr. *elaphros*, light]: genus of *Carabidæ*. They have prominent eyes.

ELAPIDAE: genus of serpents: see ELAPS.

ELAPS, *ē′laps:* genus of venomous serpents, inhabiting the warm parts of the world, chiefly the Indian islands, Australia, and tropical America. They are of slender cylindrical form, with elongated head, and often of bright and beautiful colors. They are not very agile, are said to prey chiefly on other reptiles, and live among the luxuriant vegetation of meadows or forests.

ELAPSE, v. *ĕ-lăps′* [L. *elapsus*, slipped or glided away —from *ex*, out of; *lapsus*, slipped or glided]: to pass away silently; to slide or slip away; applied to time. ELAP′SING, imp. ELAPSED′, pp. *-lăpst′*.

EL-ARABAH, *ĕl-â′râ-bâ:* southern part of the deep valley that extends from Mount Hermon on the n. to the gulf of Akabah, or the eastern horn of the Red Sea. The n. part of this deep valley is called El-Ghor. The length

of El-Arabah from the dividing ridge of chalk hills (Akrabbim) s. of the Dead Sea, to the gulf is about 100 m.; width at the gulf, less than four m.; 70 m. n. it is four times as wide. On its w. side the Tih hills rise by abrupt steps 1,500 ft. or more. The plateau at their summit is known as 'the desert of the wandering.' Up through them from the valley there are two passes: one, near the gulf and very steep, is much used by the pilgrims to Mecca; the other, on the road from Petra to Hebron, and rising 1,000 ft. higher than the plateau is probably the path down which Israel, attempting (contrary to the Divine command) to go up to the promised land, was driven by the Amalekites. On the e. side of El-Arabah are the mountains of Edom which are green, and in many parts capable of cultivation. Mount Hor, the principal peak, is 5,000 ft. high. Abundant ruins of ancient towns remain. There are wadys (ravines) descending from the mountains, which supply water sufficient to irrigate the ground at least in part and at times. One of these, beginning near the head of the Red Sea, extends to Petral and thence to the Dead Sea. A Roman road anciently went through it of which some traces remain. Another leads somewhat directly to Petra. As the n. division of the valley (El-Ghor) extends from the Dead Sea to Mount Hermon, forming the valley of the Jordan, many persons formerly supposed that the Jordan originally flowed on through El-Arabah to the gulf. But this theory has been disproved by the discovery of the fact that the Jordan and the Dead Sea are lower than the gulf. As to El-Arabah itself the waters of its n. part flow into the Dead Sea; those of the s. part, into the gulf.

EL-ARAISH, *ĕl-â-rīsh′*, or L'Araish, or Larache, *lâ-râsh′:* fortified town, province of Aygar, Morocco, on the Mediterranean at the mouth of the Luccos river or the wady El-Araish. It is the centre of important inland traffic between Egypt and Syria, has a handsome mosque and large market place, and it is the site of the ancient Egyptian penal colony of Rhinocolura. Pop. abt. 4,000.

ELASMOBRANCHII, *ē-lăs-mō-brăng′kĭ-i:* name proposed by Bonaparte, now largely used for the order of fishes termed also *Chondropterygii* (see Cartilaginous Fishes). The Elasmobranchii comprises the sharks, rays, and chimæras (q.v.); and is divided into two sub-orders, *Plagiostomata* and *Holocephala.*

ELASMOSAURIANS, *ē-lăs-mō-saw′rĭ-anz:* genus of huge marine saurians of the cretaceous period, combining the characters of serpents, lizards, and plesiosaurians, described also as a kind of reptilian whales. One species had vertebræ as large as those of an elephant, the bulk of a whale, the neck long and flexible, the paddles short, and the tail serpent-like; a long, narrow, flat muzzle; spout holes, and long, sharp teeth. It attained a length of 45 ft., and its remains are found chiefly in New Jersey.

ELASMOTHERIUM, n., *ĕ-lăs-mō-thē′rĭ-ŭm* [Gr. *elasma,* metal beaten out, and *thērion,* a wild animal]: in *paleon.,*

a pachyderm, family *Rhinocerid*æ, found in the Post-pliocene beds in various parts of Europe.

ELASTIC, a. *ĕ-lăs'tĭk* [F. *élastique*—from Gr. *elastikŏs*, elastic; Gr. *elasma*, a plate of metal that has been hammered out—from *elauno*, I beat or draw out]: springing back; having the power to return to the form from which it is bent, drawn, or pressed. ELAS'TICALLY, ad. *-tĭ-kăl-lĭ* ELASTICITY, n. *ĕl'ăs-tĭs'ĭ-tĭ* [F. *élasticité*]: the power possessed by some bodies of returning to the position from which they are bent, drawn, or pressed. ELAS'TIN, n. *-tĭn*, the chief constituent of elastic tissue in the body. ELASTIC BITUMEN, a mineral occurring in soft fungoid masses, with a resinous lustre, flexible and elastic. ELASTIC-FLUID, n. fluid which has the property of expanding in all directions after the removal of external pressure, as the air. ELASTIC TISSUE, known also as Yellow Fibrous Tissue, one of the forms of Fibrous Tissue (q.v.). It derives its name from the remarkable physical property which it possesses of permitting its fibres to be drawn out to double their length, and again returning to their original length. It occurs in various ligamentous and other structures of the animal body, in which elasticity is required, as, for example, in the vocal chords, the membranes connecting the cartilaginous rings of the trachea, the middle coat of the arteries and the skin.

ELASTIC'ITY, or SPRING: power, in a substance, of returning to the position whence it has been bent, drawn, or pressed. When an external force acts upon a solid body, it produces at first slight alterations in the relative positions of the particles; and if before these alterations exceed a certain limit, the force ceases to act, the particles return to their former position, and the disfigurement disappears. This power or property of recovering the previous form after alteration, is called elasticity, and we are justified in ascribing it to all bodies, though in very different degrees. It was formerly believed that there were definite limits within which changes of form produced by pressure or other forces disappeared completely; for instance, that when a weight of no great magnitude is suspended from a metallic wire, the slight increase of length which the wire is observed to undergo, is completely lost when the weight is removed; and the limit to which the wire might thus be stretched, and still suffer no permanent increase of length, was called the limit of its elasticity. But recent more accurate experiments have shown that no such limits exist, at least in the case of metals; or, which is the same thing, that permanent lengthening results, however slightly the wire be loaded it never contracts again quite so far as it was stretched. It is necessary, therefore, to fix the limit arbitrarily; and this is done by agreeing that it shall be held to begin when the metal in question suffers a permanent elongation of 0.00005 of its length. To get the elastic extensibility of a wire, then, we must compare its length with a weight suspended, with its length when the weight is

removed. In this way it is found that the extensions produced are proportional to the extending forces or weights. From this law we can calculate what weight it would require to stretch a wire or rod of a sq. inch in section to double its own length; supposing it possible to proceed so far without breaking it, and that the law of elasticity continued up to this point unaltered. This weight, different for every metal or kind of wood, is called the *coefficient* or *modulus of elasticity* of the particular substance; and is used in mechanics in calculating how far a given weight will extend a wire or rod of given diameter. This coefficient is not constant for the same metal; for all circumstances that increase the density of the metal, increase the modulus of elasticity. Bodies manifest elasticity not only when extended in length, but also when compressed, when bent, or when twisted. If an ivory ball be dropped from a height upon a marble slab smeared with fat and lamp-black, when caught after the rebound, it is seen to have touched the marble, not in a point, but in a circle of several lines in diameter; and must therefore have lost for a time its spherical shape over that extent. In the same way the mark of a well hit golf-ball is broadly shown upon the face of a club after the stroke. The elasticity shown by wires and threads of glass when twisted, has been turned to account in the torsion balance (q.v.), for measuring other weak forces. Steel, ivory, caoutchouc, etc., are well known for elastic properties, to which they owe much of their utility.

The propagation of waves of sound through solid bodies depends upon their elasticity; and from observations of this kind made with different substances, the modulus of elasticity for each may be deduced; the results, however, differ slightly from those arrived at by attaching weights, owing to the heat produced by the vibratory movement.

All solid bodies are only imperfectly elastic—that is, they do not quite recover their form and volume when the disturbing forces ceases. Liquids and gases, on the contrary, are perfectly elastic, or return exactly to their original bulk or volume when the pressure is removed. The elasticity of liquids and gases, however, act only in expanding after compression, while that of solids acts also in contracting after extension. The expansive elasticity of liquids and gases is equal to the force used to compress them. Water and other liquids are easily seen to be compressible, by the fact of their conveying sound—a sound-wave being merely a *state* of compression, propagated from each layer of the liquid to the next. The coefficient of elasticity of water determined by Colladon and Sturn, from the velocity of sound in the Lake of Geneva, agrees very well with that determined by direct measurements in Oersted's apparatus. The discovery of the compressibility of water is an English one, due to Canton, 1762. Previous attempts, by Italian and Dutch philosophers, to compress water by hammering a silver shell filled with that fluid, had failed to give any certain

result, as the water was forced through the pores of the metal. At a temperature of 50°, one atmosphere compresses water to about 0.999995 of its volume. From the existence of maximum density temperature for water, some curious consequences arise with regard to the effects of pressure on the fluid. The volumes or bulks which a given quantity of any gas assumes under different pressures, are nearly in inverse proportion to the pressures: see MARIOTTE'S LAW. The elasticity of gases is measured usually by the height of the column of mercury that they sustain. The elasticity of gases is a force much and variously employed in the arts of life: see AIR-GUN: AIR-PUMP: GUN-POWDER, etc.

ELATE, v. *ē'lāt* [L. *elātŭs*, raised, exalted—from *ex*, out of; *lātus*, carried: It. *elato*]: to raise in spirits; to make proud; to elevate with success; to exalt: ADJ. flushed, as with success; proud; exalted. ELA'TING, imp. ELA'TED, pp.: ADJ. elevated in spirits, as with honor or success. ELATION, n. *ĕ-lā'shŭn*, vanity or pride resulting from success; joyful elevation of mind. ELA'TEDLY, ad. *-lĭ*.—SYN. of 'elate, a.': lofty; haughty; puffed up.

ELATEA, *ĕl-â-tē'â* (anc. CYTHÆRON): range of mountains between Bœotia and Attica in Greece. The loftiest peak arises somewhat over 4,600 ft. above the sea.

ELATER, n. *ĕl'ă-tėr* [Gr. *elătēr*, a driver]: in *bot.*, an elastic spirally twisted filament for dispersing the spores, as in some liverworts; the click-beetle. ELATERITE, n. *ĕ-lăt'ėr-īt*, an elastic mineral pitch, called also *elastic bitumen* (see BITUMEN).

ELATER, *ĕl'a-tėr* or *ē-lā'tėr:* Linnæan genus of coleopterous insects, now divided into many genera, and forming the tribe or family *Elateridæ*. They have a narrow elongated body; the head is in almost all cases inserted deeply into the thorax; a strong spine on the under part of the thorax at its base, fits into a groove; the legs are short and rather slender. They are generally found upon the flowers and leaves of plants, which are their food. When disturbed, they fold their legs and antennæ close to the body, and let themselves drop to the ground. If they fall on their back, or are placed on it, the shortness of their legs incapacitates them for obtaining another position by the means common to other insects; but they are enabled to do so by a violent muscular exertion, arching the body a little, and suddenly straightening it again, so that they fling themselves into the air with a jerk and a *click*. Hence the names CLICK-BEETLE (q.v.) and SKIP-JACK. The spine and groove of the thorax are supposed to be of use in this. The larvæ are long, rather slender, with six feet near the head, and a tough skin. Many feed on rotten wood; others, WIRE-WORMS (q.v.), on the roots of plants. Some of the *Elateridæ* of tropical regions diffuse from spots on the thorax a strong and beautiful light, and are called fire-flies (q.v.).

ELATERIUM, *ĕl-a-tē'rĭ-ŭm:* a drug obtained from the fruit of the SQUIRTING CUCUMBER, or SPIRTING CUCUM-

BER (*Ecbalium agreste*, known formerly as *Momordica Elaterium*), called also Wild Cucumber, an annual plant of the nat. ord. Cucurbitaceæ, native of the s. of Europe, common on rubbish heaps in the villages of Greece and the Archipelago. The whole plant is rough, with stiff hairs; it has a trailing branching stem, without tendrils; the leaves are heart-shaped, somewhat lobed and toothed, on long stalks; the flowers axillary, yellow, the male flowers in small racemes; the fruit oblong, about an inch and a half long, grayish green, covered with soft prickles, and finally parting from its stalk, and expelling its seeds with a thin mucus through the aperture where the stalk was inserted. This remarkable phenomenon is ascribed to osmotic action within the fruit; a thin membrane separating a mucus which immediately surrounds the seeds from a less dense juice which abounds in the succulent part of the fruit, and the quantity of the former being gradually increased at the expense of the latter, till, on the perfect ripening of the fruit, the much distended central cell is opened, to permit its ejection. It is this mucus surrounding the seeds—a thick green mucus of a very peculiar character—which contains the elaterium. To obtain the drug, the juice of the nearly ripened fruit is allowed to stand for a short time, when it becomes turbid, and deposits a sediment. The sediment, carefully collected and dried, is elaterium. It is of a pale grayish-green color, light and friable, with an acrid taste, and a peculiar not unpleasant odor. It is an exceedingly powerful or drastic purgative, used chiefly in dropsies, and in very small often-repeated doses. It should not be used except under medical advice. It acts as an irritant not only on the eyes, if it comes in contact with them, but even on the fingers of those who handle it. Its properties seem to depend chiefly on a crystalline principle called *Elaterine*. The use of elaterium was known to the ancients.

ELATH, *ē′lath*, or ELANE (now AILAH): town in Idumea, on the Elanitic gulf of the Red Sea; a station on the route between Cairo and Medina. From Elath, Solomon sent out his ships for trade with Ophir.

ELATINACEÆ, n. *ē-lăt-ĭ-nā′sē-ē* [Gr. *elatē*, the pine, from the resemblance of their leaves]: in *bot.*, water peppers; order of plants, alliance *Rutales:* see RUTACEÆ ELATINE, n. *ĕl-a-tī′nē*, typical genus of the order *Elatinaceæ.*

ELAT′MA: see JELATOM.

ELBA, *ĕl′bâ* (Lat. *Ilva*, Gr. *Æthalia*): island belonging to the kingdom of Italy, in the Mediterranean Sea, between Corsica and the coast of Tuscany, from the latter of which it is separated by the channel of Piombino, a strait 5 m. in breadth. The island has abt. 85 sq. m.; greatest length about 18 m., breadth from 3 to 10 m., this irregularity being caused by indentations on its n. and s. shores. The coast is bold and precipitous. The surface is traversed from w. to e. by a chain of mountains, which divides into

two spurs at the e. extremity of the island; the highest summit, Monte della Capana, rising 3,600 ft. above sea-level. These mountains are for the most part bare; but on their lower ridges, and in the valleys, the vine, olive, mulberry and other trees flourish. The climate, except in the low-lying districts on the shore, is temperate and healthful. There are few streams in Elba, but it has numerous wells. The principal products are wines, white, red, and sweet, and of good quality; wheat, Indian corn, vegetables, and water-melons. Fifty thousand cwts. of salt are produced annually from the salt-pans on the shore. Sheep, goats, pigs, and asses abound, but horned cattle and horses are scarce; the coasts supply fish plentifully. Iron of excellent quality is obtained from a mountain on the e. coast, 2 m. in circumference, 500 ft. in height; almost entirely a mass of ore, so rich that it yields from 50 to 75 per cent. Elba yields also loadstone, alum, vitriol, and marble. Porto Ferrajo, capital and residence of the gov., has a pop. about 5,500. Elba has been rendered famous in history from having been Napoleon's place of exile 1814, May—1815, Feb. Pop. (1900) 25,000.

EL BASSAN, *ĕl-bâs-sân'*, or ALBASSAN, *âl-*, or ILBASSAN, *ĭl-*: town of Turkey, in the central part of Albania. Pop. 10,000.

ELBE, *ĕlb*, Ger. *ĕl'bĕh* (called by the Romans *Albis*—i.e., white—and by the Bohemians *Labe*): important river of n. Europe. It originates in the confluence of numerous streams which rise at the s.w. base of the Schneekoppe (Snowcap), one of the highest summits of the Riesen-Gebirge, a mountain-range on the n. border of Bohemia. The course of the Elbe begins near lat. 50° 45′ n., long. 15° 36′ e.; about 4,400 ft. above sea-level. Its total length, including windings, is estimated 700 to 720 m., and its basin at 56,000 sq. miles. The average depth is 10 ft., mean breadth 900 ft., though occasionally it has a width of upward of 1,000 ft., and at its mouth of several miles. In the course of its progress to the sea, it is joined by 17 rivers and upward of 70 smaller streams. From the base of the Schneekoppe, it flows s. to Pardubitz, then w. to Brandeis, and afterward in a general n.w. direction past Melnik, Leitmeritz, Aussig, and Tetschen, where it quits the Bohemian territory, and enters Saxony. At this point, it is 355 ft. wide. Its principal affluent in Bohemia is the Moldau. On its course n.w. through Saxony, the Elbe passes Pirna, Dresden, and Meissen, and entering Prussian Saxony, about 7 m. above Mühlberg, it advances to Torgau and Wittenberg, whence it flows first w., then n.w. to Magdeburg, receiving in its progress the Mulde and the Saale, both from the left. From Magdeburg flowing n.e., the Elbe arrives at the border of Brandenburg, receiving the Havel from the right; then turning n.w., it forms the boundary between Prussian Saxony and Brandenburg, and enters Hanover, through which it flows for upward of 30 m. Then still flowing n.w., it forms the boundary of

Lauenburg, the Hamburg territory, and Holstein on the n., and Hanover on the s., until it empties into the North Sea at Cuxhaven, where it attains a breadth of upward of 10 miles. At this point, the tide rises 12 or 13 ft. The Elbe is divided into several branches between Hamburg on the n., and Harburg on the s., by the numerous islands that there interrupt its course. Vessels of 14 ft. draught can at all times ascend to Hamburg. The scenery of the valley of the Elbe, though generally pleasing, is not remarkable, except between Aussig and Dresden. Between these two towns, the course of the Elbe is generally between bold cliffs, and high natural battlements of rock; the banks covered with foliage, wherever a tree can support itself; and occasionally varied by a strip of green glade. It has been said that here the Elbe has all the variety of the English Wye, on a scale nearly as majestic as that of the Rhine. Its waters are stocked with abundance of highly esteemed fish; beavers likewise build in the stream. Steam-boats ply from Dresden up the river, and down as far as Torgau, as well as from Magdeburg to the sea. The navigation of the Elbe was formerly impeded by all manner of imposts and monopolies; and sand was allowed to accumulate, so that vessels were often obliged to wait three or four weeks for want of sufficient water. The former of these impediments has of late years been gradually removed, till in 1870 all tolls were abolished, but something remains to be done toward improving the channel.

ELBERFELD, *ĕl'bĕr-fĕlt:* one of the most important manufacturing towns in Germany, on both sides of the Wupper, an affluent of the Rhine, 16 m. e.n.e. of Düsseldorf. Its site, in the narrow and hill-girt valley of the Wupper, is picturesque and healthful. The old parts of the town are poorly built, straggling, and irregular, but the newer portion is well built, with numerous spacious and imposing buildings, in a high architectural style. Elberfeld is noted chiefly for its dyeing, bleaching, and printing establishments, also for its extensive and important manufactures of cotton, silks, tapes, ribbons, merinos, fancy woolen goods, velvets, etc. Bleach-fields occupy a great part of the environs of Elberfeld, and of the banks of the Wupper, the waters of which are said to have very valuable bleaching properties. At Elberfeld, the well-known dye, Turkey red, is imparted to yarns, at a cheaper rate, and with more clearness and firmness of color, than at any other town in Europe. The patterns for the printed goods are designed at Elberfeld. Elberfeld supports, among its numerous educational institutions, an important establishment, in which young manufacturers and overseers are taught the management of the Jacquard-loom, pattern-drawing, etc. Like the rest of the Wupper valley, Elberfeld is notable for religious zeal and orthodoxy. Elberfeld is connected by a tramway with the neighboring town of Barmen (q.v.), also the seat of extensive manufactures. Pop. (1900) 156,937.

ELBEUF, or Elbœuf, *ĕl-bœf′:* manufacturing town of France, dept. of Seine-Inférieure, delightfully situated in a picturesque valley on the left bank of the Seine, about 75 m. n.w. from Paris. It was originally badly built, but has recently been greatly improved. Large factories have arisen rapidly; and a spacious market place (*champ de foire*), adorned with rows of chestnut-trees, has been erected. The two principal public buildings of Elbeuf are the churches of St. Etienne and St. Jean-Baptiste, both containing fine specimens of richly painted glass. The factories of Elbeuf and the vicinity exceed 200 in number; these are for the most part worked by steam-power, and give regular employment to more than the half of the population. The manufactures are principally double-milled and waterproof cloth, flannel fabrics, billiard table-covers, and light woolens of every color and description. Elbeuf has active steam communication with Paris, Havre, and Rouen. Elbeuf, which has been called the Leeds of France, had 80 cloth manufactories as early as the 16th c. In consequence of the revocation of the Edict of Nantes, the greater number of the cloth manufacturers emigrated; and it was not till after the Revolution of 1789, since the separation of Belgium and France, that industry again began to flourish. Pop. (1901) 19,050.

ELBING, *ĕl′bĭng:* trading and manufacturing town in w. Prussia, in a fertile valley, on the navigable river of the same name, 34 m. e.s.e. of Danzig, and 5 m. s. of the s.w. extremity of the Frisches Haff, into which the Elbing flows. It is connected by a canal with the Nogat, the e. arm of the Vistula. The town was formerly surrounded with walls and mounds, of which there are few remains. Of the numerous churches, the most remarkable is the Marienkirche, erected in the 14th c. The gymnasium, founded in 1536, contains the town library, 24,000 vols. There are likewise several well-conducted educational and charitable institutions. The manufactures are chiefly linen and cotton cloths, leather, tobacco, soap, and chicory. There are also oil manufactories, iron founderies, breweries, dye and print works. Elbing was founded about the beginning of the 13th c. by colonists from Lübeck and Bremen, who settled around the fortress erected by the German knights. After various vicissitudes, it was annexed to Prussia 1772, and after a period of decline, is again thriving. The larger vessels unload at Pilau, which serves as the harbor of Elbing. Pop. (1900) 52,510.

ELBOW, n. *ĕl′bō* [AS, *elnboga;* Dut. *elleboog;* Icel. *alnbogi*, the bow or bending of the arm: Gr. *ōlĕnē;* L. *ulna*, the forearm; and AS. *boga*, a bending]: the joint or outer curve in the middle of the arm when bent (see Arm); a sudden turn or bend in a river or road; the obtuse angle of a wall or building: V. to push or drive, as with the elbow; to encroach on. El′bowing, imp.: Adj. pushing; jostling. El′bowed, pp. *-bōd.* Elbow-chair, arm-chair. Elbow-joint, n. in *anat.*, a hinge-joint at the spot where the lower extremity of the humerus is in contact with the

radius and ulna. ELBOW-PIECES, in *armor*, known as *coudieres*, metal plates used to cover the junction of the rere-brace and vant brace by which the upper and lower half of the arm were covered They were sometimes of inordinate size. An *elbow-gauntlet*, was a gauntlet of plate reaching the elbow, adopted from the Asiatics in the 16th c. ELBOW-ROOM, ample room for motion. ELBOW-TONGS, n. crucible tongs with jaws bent between the joint and chops. AT THE ELBOW, at hand; near. JOG THE ELBOW, to waken up; to remind a person of a thing. OUT AT ELBOWS, the sleeve of a coat so torn or old as to show the shirt beneath; having shabby clothes; reduced in circumstances. ELBOW-GREASE, *familiarly*, continuous hard labor in rubbing; the perspiration excited by hard physical work.

EL CANEY, a fortified town of Cuba; 4 m. n.e. of Santiago. During the war with Spain it was the scene of a great American victory. Captain Capron, who led the advance of General Lawton's command, fired the first shot of the fight at 6 A. M. on 1898, July 1, and the battle continued from sunrise to sunset, with only an occasional short intermission. A shot from Capron's battery of four guns tore away the Spanish flag on the fortification. The American guns were not heavy enough to destroy the enemy's works, and at 8 o'clock General Lawton's infantry assaulted and captured the hill with many prisoners. In 1901 the United States government purchased the battle-field and approaches for a national reservation.

ELCESAITES, *ĕl-sē′sā-īts* or ELCESEANS, *ĕl-sē′sē-anz* [named after *Elxai*, a Jew, their founder]: in *chh. hist.*, sect founded by Elxai, in the 2d c., during the reign of Trajan. Elxai commingled Oriental philosophy with Judaism. He speaks respectfully of the Messiah, but whether he referred to Jesus of Nazareth is not quite plain, and Epiphanius doubts whether the Elceaites should be regarded as a Christian or as a Jewish sect.

ELCHÉ, *āl′chā* (anciently, *Ilice*, or *Illice*): town of Spain, province of Alicante, 16 m. s.w. of the town of Alicante, picturesquely built on both sides of a steep ravine, near the Elda, a tributary of the Segura, and about two leagues from the sea. It has an Oriental appearance. The climate is like that of eastern lands, winter is unknown, and around the town rises a huge encircling plantation of palms; the Arab alone is lacking to complete the likeness to an Oriental city. Elché is flourishing and well built, its streets in general are wide and clean, and it has numerous squares and public walks. The church of Santa Maria is an imposing edifice, with a large dome, five gates, a famous organ, and a tabernacle made of precious marbles. The dates gathered from the palm-plantation around Elché are exported from Alicante; they are not so good as Barbary dates, though sold as such. Its manufactures are linens, woolens, cottons, brandy, wine, cigars, oil, soap, etc.; in these articles, and in cattle, rice, and wool, there is considerable trade. Pop. about 18,500

ELCHINGEN, *ĕl′ċhĭng-ĕn:* village of Bavaria, on the left bank of the Danube, about eight m. n.e. of Ulm: noteworthy as the scene of a battle, 1805, Oct. 13, between the French under Ney and the Austrians under Laudon, in which the latter were defeated. Ney's victory obtained for him the title of Duke of Elchingen.

ELCHO, *ĕl′kō,* Francis Wemyss Charteris Douglas, Lord: b. 1818, Aug. 4; succeeded his father as Earl of Wemyss 1883. Educated at Christ-church, Oxford, where he graduated 1841, he was returned to the house of commons as M.P. for East Gloucestershire 1841, July, to 1846, Feb., and sat for Haddingtonshire 1847–82. He accepted office in the coalition govt. of the Earl of Aberdeen, and was a lord of the treasury 1853, Jan., to 1855, Feb. In the organization of the Rifle Volunteers in Great Britain 1859, the centre of the volunteer military organization, Lord Elcho took the earliest and most prominent part. He is LL.D. of Edinburgh University. In 1871 he published *Letters on Military Organization.*

ELD, n. *ĕld* [AS. *yldo,* antiquity, old age; *eald,* old: Icel. *aldr,* old age: Goth. *alds,* an age]: in *OE.,* old; old age; antiquity: V. to make old. El′ding, imp. El′ded. pp.

ELDER, Susan Blanchard, American writer: b. Fort Jessup, La., 1835, April 19. She was married to C. D. Elder of New Orleans. She began to write for the press, under the name 'Hermine,' when quite young. She has published: *The Loss of the Papacy; James the Second; Savonarola.* Her contributions to Roman Catholic publications are numerous. Her dramas are written for representation in Roman Catholic colleges.

ELDER, a. *ĕl′dėr* [AS. *eald,* old; *yldra,* elder: Icel. *ellri,* elder (see Old)]: senior; opposed to *younger;* older; compar. degree of *old:* N. one advanced in life; a member of the lowest ecclesiastical court in the Presbyterian Church—also called a Ruling elder. El′dest, a. *-dĕst* [AS. *yldesta*]: superl. degree of *old;* most advanced in age, usually applied to persons. El′dership, n. office of an elder. El′derly, a. *-lĭ,* somewhat old. Elder-brethren, n. the masters of the Trinity House, in London. Elder-son, n. among the Albigenses and other Cathari, the higher of two vicars attached to the bishop.

ELDER, n. *ĕl′dėr* [AS. *ellarn;* Icel. *elri* or *alri,* elder-tree: Ger. *holder,* the elder-tree—from Ger. *hohl,* hollow; *der* or *tar,* signifying tree, so called from its hollow wood]: a common tree producing white flowers and dark-purple berries; the *Sambūcŭs nĭgră,* ord. *Căprĭfŏlĭācĕæ. Note.*—Skeat says that *d* is excrescent, and that the true spelling is *eller.*

EL′DER (*Sambucus*): genus of plants of the nat. ord. *Caprifoliaceæ,* chiefly of shrubs and trees, with pinnate leaves, small flowers of which the corolla is wheel-shaped and 5-cleft, and 3-seeded berries. The wood of the young shoots has large pith. The Common Elder (*S. canadensis*)

has white pith and black berries. The RED-BERRIED ELDER (*S. pubens*) has brown pith; berries rarely white; bark warty.—*S. nigra* (Scotch, Bourtree) of Europe and Asia is a very large shrub, sometimes a small tree, with rather large leaves, and large terminal cymes of cream-colored flowers, which are followed by young black—or rarely whitish—berries. Its leaves and young shoots diffuse a narcotic odor, and it is said to be dangerous to sleep under its shade. The inner bark has a bitter acrid taste. The leaves possess the same properties in a rather milder degree. The flowers have a peculiar sweetish and rather sickening smell, but are much used for making a distilled water—*Elder Flower Water*—which has a very agreeable odor, and is employed both in perfumery and in confectionery. Distilled with water alone they yield a volatile oil, which, on cooling, assumes a buttery consistence. A popular cooling ointment is made by boiling them in lard. They are used also for imparting a flavor to currant-wine and jelly, being added at the time of a slight fermentation which takes place in the spring of the year, after the currant-wine is made; and a wine is made from them which in scent and flavor resembles Frontignac. The clustered flower-buds are pickled, and used like capers. A grateful wine, well known in England, especially about Christmas, and in America, is made from the berries; and in parts of Kent there are large plantations of elder to supply the London market. It is generally drunk hot or *mulled*. The berries are subacid and sweetish, with a rather unpleasant flavor. A rob made from them is a gentle aperient, diuretic, and sudorific, easily administered to children. In some parts of Germany, the poorer people use them as an ingredient in soups. They are said to be largely used in England in the adulteration of port wine, and the manufacture of spurious port wine.—The wood of the elder is yellow; that of old trees is very hard and tough, takes a fine polish, is used by turners, and as a substitute for box-wood in making mathematical instruments and other articles. Tops of fishing-rods are sometimes made of it. The pith of the young shoots being very light, is generally used to make pith-balls for electrical experiments. Toys for children also are made of it; and few boys are unacquainted with the use of elder branches, from which the pith has been expelled, for making pop-guns. The elder is useful as a screen-fence near the sea and in other exposed situations, as it grows with remarkable vigor, and makes great shoots, the destruction of the more tender and less mature parts of which in winter only tends to make it more bushy and useful for shelter. It is readily propagated by portions of its shoots stuck into the ground.—The SCARLET-FRUITED ELDER (*S. racemosa*), native of s. Europe and of Siberia, much resembles the common elder, but has softer and more herbaceous shoots, remarkably large buds, which are conspicuous in winter, and racemes of greenish-white flowers, which are followed by scarlet berries, the racemes of ripe fruit having much the

appearance of beautiful pieces of coral. It is a frequent ornament of shrubberies, and when in full fruit, is almost unrivalled in beauty, but more frequently produces its fruit in cold districts than in those where the milder winter induces it to flower before the spring-frosts are over. The juice of its berries is a powerful sudorific.—The DWARF ELDER or DANEWORT (*S. Ebulus*), is a coarse herbaceous plant, with fetid smell. The *inner bark* has been employed in dropsical complaints as a hydragogue cathartic, given in the form of a decoction prepared by boiling down 1 oz. of the bark in 2 pints of water till the whole is concentrated to 1 pint. The dose is about 4 fluid ounces. In smaller quantities, it is useful as an aperient in certain chronic disorders. The *flowers* are white when freshly plucked, but become yellow in drying, and consist of a volatile oil, certain gummy, resinous, albuminous, and saline matters, and are stimulant and sudorific. They are employed in the preparation of *elder flower water* by adding 2 gallons of water and 3 ounces of rectified spirit to 10 lbs. of the flowers, and distilling off about 1 gallon. It is a good perfume. *White elder ointment* is procured by boiling equal weights of lard and elder flowers, and pressing through a cloth. It has an agreeable odor, and is employed as a cooling application to surfaces which are irritable. When the berries are expressed, they yield a purple juice named *elder rob*, which, when diluted with water, is useful in inflammatory and febrile complaints as a cooling drink. It contains malic and citric acids, sugar, gum, etc.

EL'DER: office-bearer in Presb. churches, ranking next below pastor or bishop. The name is an exact translation of the Greek *presbyteros*, which occurs frequently in the New Testament, and from which the English word *priest* is derived. That the *presbyteroi* of the churches of the apostolic age were not *priests* in the special sense of that word, in which it denotes a person appointed to offer sacrifice on behalf of others, and to appear for them before God, is admitted by Protestants in general; but there remains much division of opinion as to the precise meaning of the term, and the bearing of the passages in which it occurs on the subject of church government. See BISHOP: CONGREGATIONALISM: PRESBYTERIANISM. All are agreed, indeed, that *bishops* and all pastors of congregations are included among *elders* in the scriptural use of the term; but the use of it is now limited in Presbyterian churches to designate the office-bearers associated with the minister of each congregation in the care and oversight of the flock. The New Testament use, however, remains in some Bapt. churches, which speak of their pastors as elders; and in the Meth. Episc. Church, presiding elders are appointed to have an oversight of the churches in a district. Elders exist in the various Presbyterially organized churches of the Reformation; and even in the Church of England, Bp. Burnet states that their introduction was prevented only by Queen Elizabeth's dislike to a proposal, in which, with Burleigh and others of her advisers, she saw danger of an abatement

of her prerogative, 'since, if the concerns of religion came into popular hands, there would be a power set up distinct from hers, over which she could have no authority.' In her view a body of elders in a local church probably seemed a dangerous approach to Congregationalism, from which, however, its principle is evidently widely diverse. In some Prot. churches, elders are now appointed only for a certain term of office; but formerly it was, and generally it is, until death, resignation, removal from the bounds of the congregation, or deposition. The appointment of elders takes place variously: in the Established Church of Scotland, they have generally been nominated by the kirk-session (consisting of the ministers and elders); in the other Presb. churches of Britain and America, they are elected by the congregation. In most of the churches of the continent of Europe, which have any kind of connection with the state, there is some regulation of the civil law or some interference of the civil authorities in this matter. The ordination of elders takes place in the congregation, but usually without imposition of hands; a difference between the mode of ordination of elders and ministers for which it is not easy to account, and which has certainly tended to produce a general impression that a greater difference of office subsists than the advocates of Presbyterianism admit. In the Established Church of Scotland, the elders have generally discharged the functions of deacons (q.v.), at least as much as those which, according to the theory of Presbyterianism, belong to their own office; an example which, until recently, was almost universally followed in other Presbyterian churches, but is now often departed from. According to the *Second Book of Discipline* of the Church of Scotland, it is the duty of elders to watch over the spiritual welfare of the people, to admonish, to visit the sick, to assist in the examination of persons seeking admission to the Lord's Table, etc. Elders, with ministers, compose all the courts or assemblies of the Presbyterian churches, and have equal votes in all questions.

ELDER, *ĕl'dĕr*, William Henry, d.d.: Rom. Cath. abp; b. Baltimore, 1819; d. 1904, Oct. 31. He graduated at Mount St. Mary's College, Emmettsburg, Md., and the College of the Propaganda, Rome; was ordained 1846; became pres. and prof. of theol. in Mount St. Mary's; and was chosen bp. of Natchez 1857. During the civil war and the yellow fever epidemics of 1878–9, he showed great heroism in caring for the sick. He declined appointment as coadjutor abp. of San Francisco 1879, was made coadjutor to Abp. Purcell of Cincinnati 1880, and became abp., presided over the 4th provincial council of Cincinnati 1882, and was conspicuous in the 3d plenary council of Baltimore 1884. He organized in the United States the temperance society known as the Red Cross League, founded in England by Cardinal Manning.

ELDON, *ĕl'don*, Baron, Lord High Chancellor of England (John Scott): 1751, June 4—1838, Jan. 3; b. Love Lane, Newcastle, of obscure but respectable parents.

He entered University College, Oxford, 1766, with a view to the priesthood, and obtained a fellowship 1767. His runaway marriage with Bessy Surtees (1772) greatly clouded his prospects for a time, though he had with her a long and happy wedded life. He turned to the study of law 1776, soon gained success; and received knighthood and the office of solicitor-general 1788. He became atty.-gen. 1793, chief justice of the common pleas 1799, in which year, after 17 years in the house of commons, he entered the house of lords as Baron Eldon. He became Lord High Chancellor 1801—occupying the woolsack under successive govts., with little intermission, till 1827. In 1821 George IV. made him an earl; and his bro. William was raised to the peerage as Lord Stowell (q.v.). He died leaving an estate over half a million sterling.

Eldon is said to have been a man of very winning and courtly manners, and of a handsome, prepossessing appearance. In the circle of his friends he is said to have been irresistible, and probably to the charms of his manner his success in life was somewhat owing. His career amply proves that he was a man of the greatest talent, sagacity, and power, in managing men. He was undoubtedly a great lawyer, and his judgments, which have been much praised for their accuracy, fill a small library; at the same time, he took so long to arrive at them, that he has been charged with having caused more injustice by delay than less able judges by the unjustness of their decisions. For literature, as for art, he had no feeling, and the style of his decisions is generally detestable. He was a great drinker, though drink seems never to have unfitted him for work; and is said, when he went into retirement, to have spent his time over the newspapers and the gossip of old cronies, preferring their company to that of men of refinement and taste. Undoubtedly, the best of him is seen in his private relations. His love of and devotion to 'Bessy' his wife was truly beautiful. As a public man, he is far from estimable. He was no statesman; his name is not associated with even a single law intended purely for the public good. For 40 years he was a leading enemy of reform and religious liberty. The champion of the church, he never attended public worship. Without political principles, his whole stock in trade, as a politician, was zeal against the Rom. Catholics, which, however, was adequate in the state of public feeling at the time. He is said to have added parsimony to his other defects; this may have arisen from habits formed during his early struggles; but he certainly showed himself capable of generosity.—See his Life, by Twiss (1846); and Campbell's *Lives of the Lord Chancellors*.

EL DORADO, n. *ĕl dō-râ′dō* [Sp. the golden region—from *el*, the; *dorâdo*, gilt]: a country fabled to be very rich in the precious metals; a territory possessed of, or supposed to possess, great stores of silver and gold. It existed originally in the imaginations of the Spanish conquerors of America, whose insatiable avarice loved to

dream of richer rewards than those of Mexico and Peru. The Castilians found an imitator in Sir Walter Raleigh, who twice visited Guiana in quest of this fabulous region. The name has at last made for itself an abiding-place beyond the furthest limits of Spanish possession. It indicates a country in the n.e. of California, of which the capital, Placerville, stands near the spot where the first discovery of gold was made in that state. The district in question is drained by some of the n. feeders of the Sacramento, which empties itself into the Bay of San Francisco.

EL DORADO: city and cap. of Butler co., Kan., on the Walnut river 32 m. n.e. of Wichita, on the Atchison, Topeka and Santa Fé and Missouri Pacific r.rs. It is surrounded by a fine farming country making a specialty of stock-raising. It has carriage factory and flour mills, woolen mill, iron foundry, and stone quarries. It is supplied with water-works, elec. light, and gas. It has one nat. bank (cap. $50,000). Pop. 3,500.

ELDRITCH, a. *ĕl'drĭch* [Scot.: comp. Gael. *oillteil*, dreadful; *oillt-chritheach*, trembling from terror]: in *OE.* and *Scot.*, ghostly; unearthly; horrible.

ELEANOR, *ĕl'a-nor*, OF AQUITAINE, Queen of France and afterward of England: 1122-1203; daughter and heiress of William IX., Duke of Guienne or Aquitaine. She was married to Prince Louis when 15 years old, and became queen of France by his succession to the throne as Louis VII. the same year. His extreme ascetic habits and her love of pleasure, poetry, and art, unfitted them for each other and led to an estrangement which was so intensified during his second crusade to the Holy Land, on which she accompanied him, 1147, that on their return to France they were divorced 1152, Mar. 18. The same year she married Henry Plantagenet, who became king of England as Henry II. 1155. This marriage, resulting in the annexation of the duchy of Guienne to England, was displeasing to King Louis, and precipitated war between France and England. Eleanor became angered at the neglect of Henry, caused her sons Geoffrey and Richard to rebel against him, and for this was arrested 1173 and imprisoned till after Henry's death 1189, when his successor, Richard I., released her. She was regent of the kingdom during his absence in the Holy Land 1190-94, went to Germany with his ransom from captivity, arranged his marriage with the daughter of the king of Navarre, and after his return retired to the abbey of Fontevrault, where she died.

ELEATIC SCHOOL, *ē-lē-ăt'ĭk:* group of ancient Greek philosophers. It begins with Xenophanes of Colophon, who settled in Elea, a Greek city of lower Italy (whence the name), and includes Parmenides and Zeno, who both belonged to Elea, also Melissus of Samos. The most flourishing period of this philosophy was B.C. 540-460. In opposition to the physical philosophy of the Ionic schools and to the doctrine of Heraclitus (q.v.), who denied all

unchangeable being or permanence, the Eleatic philosophers made this conception of pure being, unmixed with all marks or properties derived through the senses, the foundation of all their speculations. As *being*, one and unchangeable, seemed to them to exclude all plurality and alteration of appearances, they gave up, with remarkable consistency, all attempts to explain scientifically the world as we see it; and the startling abruptness of their simple fundamental principle, taken in conjunction with the opposite doctrine of Heraclitus, was one of the chief causes that led Plato at a later period to attempt a reconciliation between the notions of *being* and *becoming*, or of absolute existence and phenomena —See XENOPHANES.

ELECAMPANE, n. *ĕl'ĕ-kăm-pān'* [Fr. *énule-campane;* Sp. and It. *enula-campana;* L. *inŭlă helĕnĭŭm*—from Gr. *helenĭŏn*, a certain plant said to have sprung from Helen's tears], (*Inula*): genus of plants of the nat. ord. *Compositæ*, sub-order *Corymbiferæ*, nearly allied to *Aster*. The only important species is the common elecampane (*I. Helenium*) native of damp meadows in the middle and south of Europe. This plant, formerly much cultivated for its root used in medicine, still retains its place in the pharmacopœias, though comparatively neglected. The root has a faint aromatic odor, and a bitter, acrid, and somewhat camphor-like taste. It acts as a gentle stimulant to the organs of secretion, promotes expectoration, and is diuretic and sudorific. It contains a peculiar principle called *Inulin*, which resembles starch, but is deposited unchanged from its solution in boiling water on its cooling, and gives a yellowish instead of a blue color with iodine; also another peculiar principle called *Helenin*, or *Elecampane Camphor*, which resembles camphor in some of its properties.

ELECT, v. *ĕ-lĕkt'* [L. *electus*, chosen or picked out—from *ex*, out of; *lectus*, chosen]: to choose or select for an office by voting; to pick out or select for a use or purpose; to select from two or more that which is preferred—as, I *elect* to go to this or that place; to choose as an object of mercy or favor; in *law*, choice between two incompatible claims; it is applicable frequently in equity practice. Election, political: see SUFFRAGE: ADJ. chosen; chosen but not invested with office: N. those selected; those chosen or selected to eternal life. ELEC'TING, imp. ELEC'TED, pp. ELEC'TION, n. *-shŭn* [F.—L.]: the choice or selection of a person or persons to fill some office; public choice, as of a member of congress; power of choosing; liberty to choose or act—as, he went by his own *election;* divine choice; predestination. ELEC'TIONEER', v. *-ēr*, to make interest for a candidate, to strive for his election. ELEC'TIVE, a. *-tĭv*, depending on choice; regulated by choice; exerting the power of choice. ELEC'TIVELY, ad. *-lĭ*. ELEC'TOR, n. *-tĕr*, one who chooses or elects; one having the right to vote; title formerly belonging to the German princes who elected the emperor. ELEC'TORAL, a. *-tĕr-ăl* [F.—L.]:

pertaining to elections or electors. ELEC'TORATE, n. *-tėr-āt* [F. *électorat*]: the dignity or territory of an elector of the German empire; the body of electors or votes. ELEC'TORSHIP, n. rank or condition of an elector. ELECTORAL FRANCHISE, the right to elect civil officers.—SYN. of 'elect, v.': to choose; select; appoint; prefer.

ELEC'TION, in Theology: the divine act by which certain individuals are chosen to salvation in Christ. The doctrine of election is the doctrine of 'God's everlasting purpose, whereby he hath constantly decreed by his secret counsel to deliver from curse and damnation those whom he has chosen in Christ out of mankind, and to bring them by Christ to everlasting salvation as vessels made to honor.' These words, substantially from the articles of religion of the Church of England, may be said to represent, in a moderate expression, the orthodox doctrine on the subject of election. Besides this form of the doctrine, there is a lower and a higher form of it, which, apart from technical and polemical language, may be said to spring—the one from the supposed subordination of the divine act or purpose to the divine foreknowledge of human conduct—the other from the exaltation of the divine act or purpose into an absolute and arbitrary supremacy, having no relation whatever to human will or conduct. The former of these extremes corresponds to the Pelagian or Arminian doctrine of E., the latter to the hyper-Augustinian or Calvinistic. The Arminian aims to condition or limit the absolute character of the divine act in redemption in some way or another; the Calvinist aims to give to this act, at least as far as traceable by man, the most arbitrary and irresponsible character. The one, while not altogether repudiating a doctrine of election, yet gives such prominence to the human conditions of the elective purpose, as (in the view of Calvinists) to destroy it altogether; the other maintains not only a doctrine of election or predestination to salvation, but also the correlative doctrine of reprobation to perdition. In the view of the Arminian, salvation is within the choice of the human will; in the view of the thorough Calvinist, the human will is of little or no account as a cause—the decree of God is everything—and this decree (which Calvin admitted to be a '*decretum horrible*') absolutely determines some to everlasting life and some to everlasting death.—The Calvinistic view is that the separation has its source in the will of God, and not in the moral conditions of mankind; though this view may sometimes be traced also in the phraseology of some who deem themselves Arminian.

It is obvious, in the mere statement of such views, how audaciously theology has sought to settle questions beyond all human scrutiny and decision. In the nature of things, the ultimate nature of the relations between the divine and human will appear indeterminable; and, notwithstanding all the labor of inquiry devoted to such subjects in the history of opinion, it cannot be said that any advance of thought has been made regarding them. The tide of battle

sets now forward, now backward, but over the same field. If the mere logic of the question be kept in view, the Calvinistic opinion has indisputable advantage over the Arminian—setting out, as it does, from the recognition of the divine will as absolutely supreme, and the source, consequently, of all subordinate action—a thought which is in the highest degree logically consistent. But then the moral perplexities which arise out of the practical application of this view, and the ease with which it may be perverted into a fanatical and dangerous error, will always repel many minds from its adoption. In any event, while divine truth may and should be explored by human logic, it is not to be held bound therein.

Although the expressions election, elect, etc., are frequent in Scripture, it cannot be said that what is known as the theological doctrine of election was acknowledged by the Christian Church till the time of Augustine. The Greek Fathers confined their attention almost entirely to questions purely *theo*logical—that is to say, relating to the character and constitution of the Godhead. Gnosticism and Arianism, the two main forms of heretical opinion before Augustine, indicate the channels into which theological discussion had previously run. It was not till the Latin mind had taken up this discussion, that the more practical question of the relation of the divine and human will in redemption came to receive special attention. The controversy between Pelagius and Augustine in the beginning of the 5th c., brought out almost all the aspects of the question which have since, at successive epochs in the history of the church, risen into renewed prominence. The contests between the Scotists and Thomists in the 14th c., between the Arminians and Calvinists, and, within the Roman Church, between the Jansenists and Molinists in the 17th c., are recurring expressions of the same radical conflict or divergency of opinion, which, as Coleridge suggested, may originate in a constitutional diversity between two classes of minds. The spirit of modern theology is adverse to the logical disputations engendered by such discussions, and finds its more appropriate and useful field of labor in the province of critical, historical, and ethical inquiry.

ELEC'TIVE SYSTEM, IN COLLEGES AND UNIVERSITIES: That course of study by which the former curriculum of Greek, Latin, mathematical, and philosophical studies is supplanted, wholly or in part, by more varied subjects, mainly scientific and historical. Its conception was due to various causes, principally to the recent development of science, to the desire to make a collegiate education prepare more directly for a subsequent career, and to the view that congenial studies give better results. The system had its origin in Harvard Univ. under Pres. Chas. W. Eliot, and has been adopted to a greater or less extent by the other leading institutions of the country. The extreme of the system has been reached by the substitution at Harvard and elsewhere of French and German for Greek in the

requirements for matriculation for the degree of bachelor of arts, thus causing a modification and giving freedom of choice in the preparatory training. In more conservative foundations the substitution of modern languages for Greek is allowed only in the course leading to the degree of bachelor of science.—Thus from the beginning of his course the matriculate selects, under advice, such studies as from term to term may make up the requisite number of hours per week, generally limited to fifteen. Certain required studies, as elocution, an elementary knowledge of physics, and English still attend the extreme development of the system. In the greater number of institutions, and still to some degree in the most liberal, the Freshman year conforms to a required course, while electives, as some modern language substituted for mathematics, begin in the Sophomore year and become general in the Junior and Senior, retaining, however, a fixed amount of science, history, and philosophy. The elective system has been the object of persistent attacks by those who claim that too great liberty of action is granted to students mentally untrained, who consequently choose those studies most congenial to them, and who vary frequently their course thus resulting in a superficial knowledge; and by others who take a broader view in maintaining that the study of classical antiquity, in great measure discarded, is necessary to literary and intellectual culture. Its advocates, on the other hand, assert that since the adoption of the essential features of the elective system the requirements for matriculation have increased in quantity and variety; that the student's self-reliance and judgment are developed; that a constant pressure is exerted by the collegiate authorities to encourage a logically connected series of studies, by means of honors and scholarships, and that as a matter of fact more and better work is done. A successful compromise, which inclines, however, to the liberal side, has been effected in the Johns Hopkins Univ.—and on a similar principle in some other institutions—in which French and German are a substitute for Greek in the requirements for matriculation, but where the student must select, from the outset, his entire course from among seven pre-arranged groups, designated by their leading subjects, and in addition must take a prescribed amount of elocution, drawing, English, and historical and philosophical studies.

ELECT'OR, in the German Empire: one of those great princes who had the right of electing the emperor or king. In the earliest times, under the Carlovingians, the crown was hereditary; afterward, Germany became formally an elective monarchy, but the election was practically almost limited to the reigning family. Under Emperor Charles IV., the right of election became limited to the holders of the highest ecclesiastical and civil offices, some of which gradually became hereditary, and connected with territorial principalities, as in the case of the Hohenstaufens and of the Dukes of Bavaria, Saxony, Swabia, etc. Thus there arose seven electors, those of Mayence, Treves, and

Cologne (as being the chief primates and chancellors of the empire), the electors of the Palatinate and of Bavaria long exercising the right by turns, and the electors of Brandenburg, Saxony, and Bohemia. From 1400 to 1708, the right was never exercised on the part of Bohemia, but otherwise no change took place from the middle of the 14th c. to the peace of Westphalia. By the peace of Westphalia, an eighth electorate was established, Bavaria and the Palatinate being each allowed the full right; and in 1692, a ninth was added, that of Brunswick-Lüneburg, but not without resistance by the electors and states of the empire, so that the new electorate was not fully recognized till 1710. In 1777, the number was again reduced to eight, the Elector Palatine inheriting Bavaria. The electors held a high and very peculiar position in the German empire. The Golden Bull describes them as 'the seven pillars and lamps of the holy empire.' They had certain important rights and privileges. They were leagued from the year 1338 for the maintenance of their freedom of election against the pope. They had royal dignities, lacking only the title of majesty. The territories belonging to their electorates were indivisible.

The peace of Luneville, 1801, made a great change in the German empire, and subsequent changes took place during the times of French ascendency, which issued in the dissolution of the ancient German empire. The title of Elector, used by the Prince of Hesse-Cassel, an electorate which was added with other new electorates in 1802, was the last relic of the old dignities, and was merely nominal even before 1866. See GERMANY.

ELECTORAL CROWN, or, more properly, CAP, was a scarlet cap, turned up with ermine, which was worn by the electors of the Empire. It was closed with a demi-circle of gold, covered with pearls, and on the top was a globe with a cross on it, also of gold.

ELECTORAL COLLEGE, PRESIDENTIAL: name applied to the electors of a state when assembled to vote for a pres. and vice-pres. of the United States. Though the federal constitution designates the number and defines the duties of electors, the term Electoral College was not used till 1821, and did not appear in law till the act of 1845, Jan. 23, which provided for filling vacancies in each 'college of electors.' The question of a mode of electing the pres. came up in the early sessions of the convention that framed the constitution, and created a great diversity of opinions. Both the Va. and the N. J. plans placed the choice of the pres. in congress; Penn. desired a popular election by districts; Conn. favored congressional selection; Mass. first wanted electors chosen by the states in proportion to population, but afterward expressed a preference for a selection by the governors of the states; Hamilton proposed a choice by secondary electors, chosen by primary electors, chosen by the people; and Gouverneur Morris advocated a general popular vote. The Va. plan was agreed to in the committee, and after the popular

election and choice by electors had been voted down, was unanimously approved by the convention. It was afterward reconsidered, and the choice by electors chosen by state legislatures substituted; this in turn was reconsidered and lost, and the choice by congress revived. Within the last two weeks of the convention, the committee of detail reported the plan very nearly as it was finally adopted. During all this discussion scarcely a word had been said about the vice-pres., and the only formal mention of that officer occurred in the committee's plan.

In Art. II., sec. 1, of the constitution it was provided that each state should *appoint* a number of electors equal to the whole number of senators and representatives to which the state might be entitled in the congress, in such manner as the legislature might direct; and that the congress might determine the time of *choosing* the electors, and the day on which they should give their votes, which day should be the same throughout the United States. Under this authority, the second congress fixed the day when the electors should meet and vote on the first Wednesday in Dec., and the day of their election 'within thirty-four days' preceding it. The first mode of election was modified by the XIIth amendment to the constitution, proposed 1803, ratified 1804, and still in force. It will be noticed that authority was originally given the legislature of each state of having its electors selected either by appointment or by choosing, i.e., by popular vote. Subsequent legislation has fixed the first Tuesday after the first Monday in Nov. as the day for choosing electors in all the states, and this date still remains as that on which, in a popular sense, the pres. and vice-pres. are elected, though in reality the election does not occur till the following Feb. In each presidential election the various political parties in the several states head their ballots with the names of their party's candidates for presidential electors, equal in number to the total of the state's senators and representatives in congress; and the individual voting is for these electoral candidates, and not for the presidential candidates. The electoral candidates of the party having a majority of the votes in a state become the presidential electors of that state and on the 2d Monday in Jan. following, these, assembled at the state cap., vote for the candidates for pres. and vice-pres. of their own political party. in the manner prescribed by Art. XII. of the Constitution (q.v.). The electoral vote of each state is transmitted direct to the pres. of the senate by a 'messenger of the electoral college' of each state, usually elected or appointed by the electors. He receives a mileage for his services; but the office of messenger is considered in itself a high distinction. The decisive election takes place before the U. S. senate and house of representatives, in joint session for the purpose, on the 2d Wednesday in Feb. following. If either candidate has a majority of the votes of the whole number of electors, he is declared by the pres.

of the senate to be duly elected, the electoral votes for pres. being counted first, and, after decision, those for vice-pres. If no candidate for pres. has such majority, the duty is devolved on the house of representatives of immediately choosing a pres. by ballot from the three candidates having the highest number of electoral votes, and if the house fails to make such choice the vice-pres. shall act as pres. Again, if no candidate for vice-pres. has the required majority, the duty is devolved on the senate of choosing a vice-pres. by ballot from the two candidates having the highest number of electoral votes. The house of representatives is allowed till Mar. 4 to choose a pres., whenever the right devolves upon it. The first electoral votes were counted by the pres. of the senate 1789, April 6 (Monday); since then the day of the week has always been Wednesday, the month Feb., and the day of the month from the 8th to the 14th.

Under congressional apportionment, based on 12th census, pres. electors (1903-13) number 476, *i.e.*, one for each 90 senators and 386 representatives, divided among the states as follows: Ala., 11; Ark., 9; Cal., 10; Col., 5; Conn., 7; Del., 3; Fla., 5; Ga., 13; Ida., 3; Ill., 27; Ind., 15; Io., 13; Kan., 10; Ky., 13; La., 9; Me., 6; Md., 8; Mass., 16; Mich., 14; Minn., 11; Miss., 10; Mo., 18; Mont., 3; Neb., 8; Nev., 3; N. H., 4; N. J., 12; N. Y., 39; N. C., 12; N. D., 4; O., 23; Or., 4; Pa., 34; R. I., 4; S. C., 9; S. D., 4; Tenn., 12; Tex., 18; Ut., 3; Vt., 4; Va., 12; Wash., 5; W. Va., 7; Wis., 13; Wyo., 3.

ELECTRIC, a. *ĕ-lĕk′trĭk*, or ELEC′TRICAL, a. *-kăl* [Gr. *elektron;* L. *electrum*, amber; F. *électrique*, electric]: pertaining to electricity; capable of exhibiting electricity when excited by friction; containing electricity; communicating a shock as produced by electricity: N. any substance capable of exhibiting electricity; an insulator, as amber, glass, etc. ELEC′TRICALLY, ad. *-lĭ*. ELECTRICIAN, n. *ē′lĕk-trĭsh′ăn*, one skilled in electricity. E′LECTRIC′ITY, n. *-trĭs′ĭ-tĭ*, the science which treats of the laws of attraction and repulsion exhibited by bodies under certain circumstances; a highly subtile and mysterious power, often called the electric fluid, which apparently pervades all bodies; *more strictly*, one of the forms of energy exhibited in lightning, the electric spark, electric current, etc.: see ELECTRICITY, THEORY OF: ATMOSPHERIC ELECTRICITY, ETC. ELEC′TRIFY, v. *-trĭ-fī*. [L. *făcĭō*, I make]: to charge or affect with electricity; to excite suddenly and violently. ELEC′TRIFYING, imp. ELEC′TRIFIED, pp. *-fīd*, charged with electricity; excited suddenly, as with a shock of electricity, generally by something of a pleasing and inspiriting nature. ELEC′TRIFI′ABLE, a. *-fī′ă-bl*, that may be electrified. ELEC′TRIFICA′TION, n. *-trĭ-fĭ-kā′shŭn*. ELEC′TRINE, a. *-trĭn*, relating to amber. ELEC′TRIZE, v. *-trīz*, to invest with electric force, to endue with electricity. ELEC′TRIZING, imp. ELEC′TRIZED, pp. *-trīzd*. ELEC′TRIZA′TION, n. *-trĭz-ā′shŭn*, act of becoming or being rendered electric. ELEC′TRODE, n. *-trōd* [Gr. *hodos*, a way]: the extremity of a conductor through which the electric current enters or quits a body. E′LECTROL′YSIS, n. *-trŏl′ĭ-sĭs* [Gr. *lusis*, a loosening, a release]: analysis or decomposition effected by electricity, known often as *Electro-Chemistry:* see ELECTRICITY. ELEC′TROLYTE, n. *-trō-līt*, a substance capable of being analyzed or decomposed by electricity. ELEC′TROLYT′IC, a. *-lĭt′ĭk*, relating to electrolysis. E′LECTROM′ETER, n. *-trŏm′ĕ-tĕr* [Gr. *metron*, a measure]: instrument for measuring the strength of an electric charge. ELEC′TROMET′RICAL, a. pertaining to. E′LECTROPH′ORUS, n. *-trŏf′ŏ-rŭs* [Gr. *phorĕō*, I bear]: instrument for accumulating or condensing electric force; an electric induction machine. ELEC′TROSCOPE, n. *-trō-skōp* [Gr. *skopĕō*, I see, I look out for]: instrument for ascertaining the existence and character of an

electric charge. ELEC'TROSCOP'IC, a. *-skŏp'ĭk*, relating to the electroscope. ELEC'TROTYPE, v. *-trō-tīp* [Gr. *tupŏs*, a figure or image]: to deposit a film of copper by the voltaic battery upon a mold taken from types or woodcuts: N. the impression thus obtained, used to print from. ELEC'TROTYPING, imp. ELEC'TROTYPED, pp. *-tīpt*. ELEC'TROTYPER, n, one who. ELEC'TRUM, n. *-trŭm* [L.], or ELEK'TRON, n. *-trŏn* [Gr.]: amber; an alloy of gold and silver, gold ore of a light brass color and containing more than 20 per cent. of silver. ELECTRIC COLUMN, an apparatus formed of numerous alternating disks of paper, silver-leaf, and zinc leaf, invention of DeLuc; generating a feeble current when there is any moisture in the atmosphere. ELECTRIC CURRENT, the stream or flow of electricity when passing from one point to another. ELECTRIC EEL (see ELECTRIC FISH). ELECTRIC JAR, a jar so prepared as to be capable of being charged with electricity; a Leyden jar. ELECTRIC BATTERY, a number of prepared jars or cells connected with each other in order to obtain a powerful discharge of electricity. ELECTRIC DISCHARGE, the passage of electricity from one body to another placed near it. ELECTRIC INDUCTION, the action of an electrified body exerted at a distance upon the electricity of another body. ELECTRIC MACHINE, an apparatus for producing electricity. ELECTRIC TELEGRAPH, an apparatus for conveying signals by means of voltaic currents passing through wires with prodigious velocity (see TELEGRAPH). ELECTRIC FLUID, the supposed matter of electricity; lightning. ELECTRO-CHEMISTRY, branch of chemistry which treats of the agency of electricity in effecting chemical changes (see ELECTRICITY). ELECTRO-CHEMICAL, pertaining to. ELECTRO-DYNAMICS, the science that treats of electricity in motion through conductors, etc. ELECTRICAL UNITS: see UNITS, SCIENTIFIC. ELECTRO-MAGNET, bar of soft iron of any form with insulated wire wound around it to form a coil or spool of which the iron is the core. When the two ends of the wire are connected to a battery or dynamo it forms a magnet of great power. ELECTRO-MAGNETISM, science that treats of the power of electricity to impart magnetic properties to bodies: the magnetism developed by a current of electricity (see MAGNETISM: DYNAMO-ELECTRIC MACHINE). ELECTRO-PLATING (also ELECTROTYPE): see ELECTRO-METALLURGY. ELECTRO-STATICS, science which treats of electricity in a state of rest. PYRO-ELECTRICITY, electricity developed by heat.

ELECTRICAL COMMUNICATION, SYSTEMS OF: the earliest practical use of electricity was for communication between distant points, the telegraph being the first commercial application of electricity.

Electric Bells.—These are single or double gongs which are rung by an electro-magnetically moved ball or hammer. The circuit runs from the bell mechanism through the battery, which furnishes the current to actuate it, out to the point or points from which it is desired to signal. The ordinary electric bell, of the vibrating variety, is

shown in diagram in Fig. 1. The hammer is attached to the iron armature, A, which is supported by the flat spring, S. At C is a screw whose point touches the armature, while M represents an electromagnet. The apparatus is so constructed that the circuit from the battery passes through the push-button, or other device, used in closing the circuit, thence through the electromagnet to the spring and armature, thence through the contact with the point of the screw, C, and thence back to the battery. When the circuit is closed at the push-button, the electromagnet attracts the armature, pulling it away from the screw, C, and causing the hammer to strike the bell. This interrupts the circuit at C, however, and deprives the electromagnet of its magnetism. The spring, S, forces the armature back, drawing the hammer away from the bell and again closing the circuit at C. This again renders the electromagnet active, causing another stroke of the bell and another interruption of the circuit.

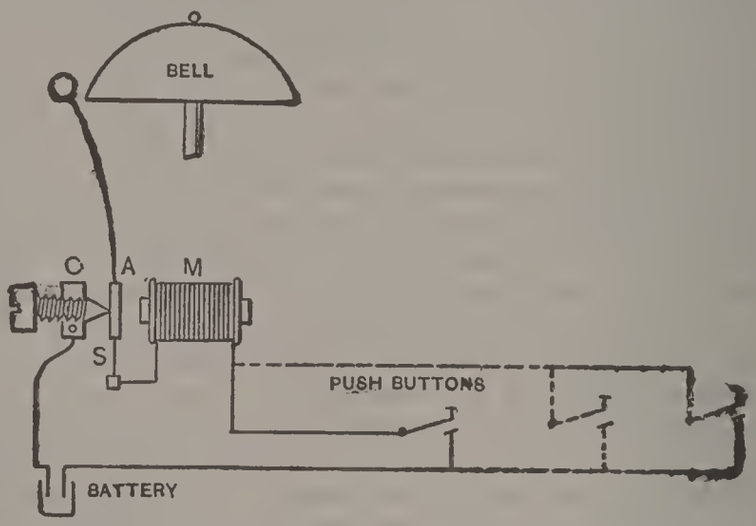


Fig. 1.

The hammer thus vibrates, continually striking the bell as long as the push-button is held closed. If the hammer and bell are removed the armature will vibrate rapidly, making a loud buzzing sound, and the instrument becomes the familiar *'buzzer.'*

The ordinary push-button consists simply of two pieces of spring brass mounted in a wooden shell and normally sprung apart out of touch with one another. By pressing a porcelain button, which projects through the casing, the brass pieces are brought into contact.

If it is desired to set the bell or 'buzzer' in motion from a number of different points, additional push buttons may be connected to the circuit as indicated by the dotted lines in Fig. 1. As may be easily seen, if any push button be depressed, the bell will ring.

Annunciators.—The annunciator is an instrument used when it is desired to know which one of a number of push-buttons, or other signaling keys, communicating with the same bell or other receiving mechanism, has

been operated. One form consists of a number of small shutters, corresponding with the number of push-buttons in the system, each of which is held in place by a latch, which may be released by an electromagnet. One of these electromagnets is included in the circuit from each push-button. When the latter is pressed the latch is released and the corresponding shutter falls. The shutter and latch are restored to their normal position manually by pressing a knob at the bottom of the annunciator. Another form of annunciator employs small swinging steel needles hanging near the cores of the electromagnets. When one of these magnets becomes active it attracts its corresponding needle. As the latter is a feeble permanent magnet it does not fall back, but remains in the indicative position until replaced to its original position.

Burglar Alarm Systems, Messenger Call Systems, Fire Alarm Systems.—A large variety of electric signaling apparatus, such as fire and burglar alarms, electric bells and annunciators, and the like, are really telegraphs. The ordinary messenger call boxes and fire alarm boxes are examples of what are called closed circuit telegraphs. In both these kinds of boxes the movement of a lever causes a short train of clockwork to turn a notched disk of metal upon the edge of which a spring lightly bears. This contact, between the disk and spring, is included in the circuit with a battery, a registering telegraph instrument and an alarm bell worked by an electromagnet. When the box is 'pulled' the disk rotates. Every time a notch passes the spring the electrical contact is broken and the circuit is opened, causing all the electromagnets in the registering instrument and the bell to lose their magnetism momentarily and release their pull upon their iron armatures. These are moved by springs, in the one case, so as to actuate a pencil point or stylus and mark a record of the signals; in the other, so as to ring a bell. The notches in the disks are spaced so as to send in groups of signals, thus --- -- - which would read as '321.' A large number of boxes can be installed on one circuit, each having a different notch spacing and sending in a different number. The closed circuit arrangement, by which current is always flowing, except when momentarily interrupted to give the signals, is specialy advantageous for alarm boxes, as a broken line wire or exhausted battery immediately sends in its own warning. The majority of burglar alarms are also constructed on this principle, a cut wire serving to send in the alarm signal.

Another variety of fire alarm depends on the heat of an incipient fire to give the signal through apparatus called thermostats. These depend for their working on the expansion of metal by heat. If a flat strip of brass and a similar strip of iron are riveted together, back to back, so to speak, the unequal expansions of the two metals will cause the compound strip to bend when it is warmed. Such a strip is arranged so that a given degree

of heat causes it to bend itself into contact with a fixed point, closing an electrical circuit and sending in an alarm.

ELECTRICAL DISTRIBUTION. There are two general systems of electrical distribution, viz., the *series* and the *parallel.*

The series method comprises the arrangement of all the devices to be supplied with current in a single circuit so that the current passes through one, on to the next, through it, thence to the next and so on, the voltage being high enough to send the current through all the lamps or motors. Fig. 1 shows the arrangement of the series system. D is the dynamo, sending current through the lamps

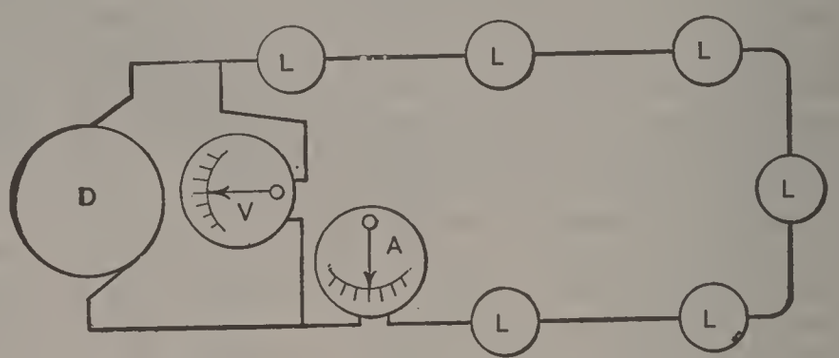


Fig. 1.

L L L L. The ampere-meter A, measures the current and voltmeter V, the pressure.

The current cannot be greater than that which the smallest device in circuit may easily carry. Usually the current is maintained at a constant value and the voltage increases or decreases with the variation in the number of lamps or motors in circuit. This system is but little used except for arc lighting.

The *parallel* system is indicated in Fig. 2, in this each lamp or motor forms a separate path from one side to the other of the circuit. This system is also known as the *constant potential* because the potential or pressure be-

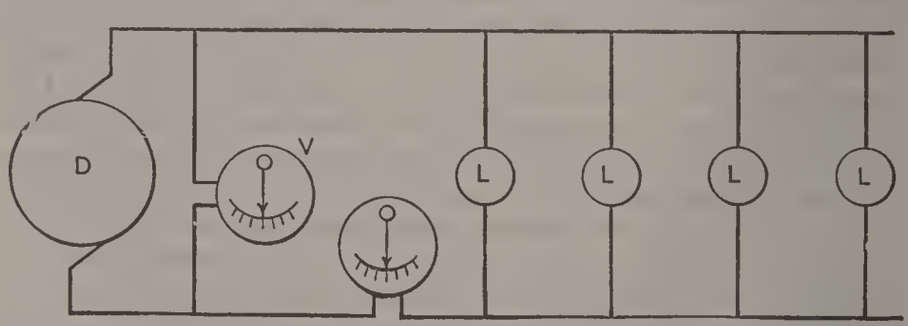


Fig. 2.

tween the two sides of the circuit is maintained constant and the current varies with the number of lamps or motors that may be in use. With this arrangement it is clear that the amount of current passing through each

device is independent of the quantity of current passing through any other and therefore this is the only system which is adapted for supplying electricity to various sizes of lamps and motors.

Conductors.—In computing the size of wire for electrical distributing systems, the current density must not exceed a certain number of amperes per square inch or centimeter, varying with the class of insulation on wires. Roughly, it ranges from 1,100 amperes per square inch in very large cables to 2000 amperes per square inch in small wires. Current densities in excess of these will so heat the wires as to burn off the insulation. Usually, however, the distance of transmission is so great that the wires must be much larger in diameter than the current flow requires, the size being in such cases, based on the 'drop' in voltage which is allowable.

The formula for the size of wire required for either direct or alternating current transmission is:

$$A = \frac{2 \times D \times I \times 11}{V}$$ in which A = area in *circular mils.*

D = Distance of transmission *in feet.*
I = Current in amperes.
V = Volts drop allowable.

The circular mil is an arbitrary unit and is equal to the square of 1,000 times the diameter of a wire. Thus a wire 0.25 inch in diameter has a cross section of 62,500 circular mils.

The volts drop is taken usually as a percentage of the pressure generated and ranges from 3 to 10 per cent. When a given amount of *power* is to be transmitted over a long distance, a high voltage reduces the size and cost of the wire. Consider 5,000 kilo-watts transmitted 50 miles. (=264,000 feet) with a 10 per cent. loss. Compare the size of wire when 10,000 volts are used, with the size required for 20,000 volts.

$$\text{Total current at 10,000 volts} = \frac{5{,}000{,}000}{10{,}000} = 500 \text{ amperes.}$$

Volts drop = 10 per cent. of 10,000 = 1,000 volts.

$$A = \frac{2 \times 264{,}000 \times 500 \times 11}{1000} = 2{,}904{,}000 \text{ circular mils.}$$

$$\text{Total current required at 20,000 volts} = \frac{5{,}000{,}000}{20{,}000} = 250$$

amperes.

Volts drop 10 per cent. of 20,000 = 2,000 volts.

$$A = \frac{2 \times 264{,}000 \times 250 \times 11}{2{,}000} = 726{,}000 \text{ circular mils.}$$

That is, the *doubling* of the voltage decreases the size of the wire *four times* or *the size of the wire required varies inversely as the square of the voltage employed.* This is the

reason of the necessity of using high voltages for long transmission lines. Alternating currents are always used because they may easily be transformed from these dangerously high pressures, down to low, harmless potentials at the end of the line, by the use of the static transformer. See *Transformer* in ELECTRICAL MACHINES.

ELECTRICAL ILLUMINATION: the conversion of electrical energy into light is, in every form of illumination now known to the art, attained by heating to a high temperature some substance which becomes incandescent by the heat produced in passing the current through a high resistance. The passage of current through a resistance is always attended by the production of heat, the amount of which is proportional to the resistance and the square of the current, or, expressed mathematically, $H = I^2 R$.

The conditions for the production of light are: (1) The substance must be a conductor of electricity; (2) Its resistance must be high; (3) It must either be capable of withstanding high temperatures without disintegrating or breaking down; or (4) It must be renewed or 'fed' as fast as consumed or destroyed.

There are four kinds of electric illumination in commercial use, viz., the arc, the incandescent, the Nernst and the mercury vapor lamps.

Arc Lamp.—This is the first electric illuminant ever devised. Its source of light is vapor and fine particles of carbon heated to a luminous temperature. If a carbon rod be connected to one pole of a dynamo (or battery) and a similar rod be joined to the other pole, current will flow through the two carbons if their two ends be touched together, thus completing the circuit. If, after touching together, the two carbons be separated, a slight distance, say $\frac{1}{4}$ inch, an arc or brilliant flame will form in the space between the two separated ends. This is caused by the vaporization of the carbon, which forms a conducting path of high resistance through the air between the two ends, over which current passes, carrying with it fine particles of carbon. The intense heat generated by the current flowing through this high resistance causes vaporization of the carbon and makes incandescent the vapor and carbon particles, and also the ends of the rods The rods are gradually consumed and, as the distance between the ends increases, due to this consumption, they must be brought closer so that the arc is maintained at its proper length.

An arc lamp is an electro-magnetic device which has carbon rods inserted in proper clamps and which automatically touches the two rods together, then separates them—called 'striking the arc'—and afterwards feeds them slowly together at the same rate that their ends are consumed.

This mechanism is very simple and comprises an electro-magnet which lifts a clutch, the latter catching on a

vertical brass rod. At the lower end of the rod is a clamp into which the upper end of the top carbon is placed. The lower carbon is held to the frame of the lamp by a similar clamp holding its lower end. Current enters by one wire from the dynamo, passes through the electro-magnet to the brass rod and to the upper carbon. The other wire from the dynamo is connected to the clamp holding the lower carbon.

When no current is passing through the lamp, the weight of the brass rod and its upper carbon causes the latter to rest with its end against the end of the lower carbon. When current is switched on to the lamp, it passes through magnets, upper carbon, across the contact between the two carbons to lower carbon and back to the dynamo by the wire connected to the lower carbon clamp. The magnet is instantly energized, exerts a pull on the clutch around the brass rod and lifts it with its attached carbon. This action draws the arc between the two carbons. As the magnet continues to lift the carbon rod, the length of arc increases and this increases the resistance to the passage of current. The current therefore diminishes and the pull of the magnet weakens, until a point is reached at which the pull of the magnet is just equal to the weight of the brass rod and the carbon. The lamp is now burning. As the carbons are consumed, the arc is lengthened, less current flows, the magnet is weakened still more, and the weight of the lifted parts overcomes the magnet pull. The carbon and rod slip down through the clutch and as the two carbons approach each other, the shorter arc allows more current to flow, strengthening the magnet pull and causing the clutch to catch the brass rod and hold it in place.

The length of arc is about $\frac{1}{4}$ of an inch, and so closely does the magnetic control regulate this length, the 'feeding' of the upper rod is almost imperceptible.

The size of carbons used in this lamp are about $\frac{1}{2}$ inch in diameter and 12 inches long. The rate of burning is approximately 2 inches per hour for the carbon connected to the positive pole, and $\frac{3}{4}$ inch per hour for the carbon connected to the negative pole.

The potential required is about 50 volts for each lamp.

During the past few years, arc lamps have been devised in which the carbons burn inside a closed glass chamber which, however, allows a small quantity of air to enter the chamber and reach the arc. This lamp greatly reduces the rate of consumption of the carbons, which is only about $\frac{1}{10}$ inch per hour for a $\frac{1}{2}$ diameter carbon. The carbons have to be renewed only about once in 10 days, where the lamps burn continuously all night.

Recently it has been found that by impregnating the carbons with certain salts, the carbon being made porous for this purpose, the arc is far more brilliant and gives for the same energy consumption a much greater light, owing to the increased size and length of the flame. This flame comes from the vapor of the salts in the carbon

added to the carbon vapor. From the extraordinary brilliance and length of the flame this is termed the 'flaming arc.'

Incandescent Lamps.—The incandescent lamp is made up of a short conductor of electricity which possesses high resistance. When electric current is passed through it, the entire conductor becomes heated as is always the case when current passes through a resistance. By properly selecting the material and making its cross section very small, a conductor of such high resistance is produced that a large amount of heat is liberated even with moderate currents. This heat is so intense that the conductor is heated to a temperature so high that it becomes luminous and emits light.

Under such temperatures as are attained the conductor would rapidly oxydize and disintegrate unless excluded from the air. The conductor is therefore hermetically sealed inside a glass bulb from which the air is completely exhausted. The conductor therefore is in a vacuum and, as no oxygen can reach it, it may be worked under temperatures which produce incandescence, without injury.

The conductors, which are technically known as 'filaments,' are made of carbon. For a 16 candle power lamp to work on a 110 volt circuit these filaments are about 10 inches in length and $\frac{1}{64}$ of an inch in diameter. For many years the manufacture of these fine carbon threads was attended with many difficulties, the only then available material, being bamboo fibres which were cut to the desired diameter and length and afterward reduced to carbon by baking in an oven. The present method, however, is to reduce cellulose to a thickish liquid or thin pulp and put this pulp under pressure in a vessel provided with tiny holes, the diameter of these holes being the desired diameter of the filaments. The cellulose is thus squirted through the holes. As the filaments exude, they are passed through a bath of chemicals which causes them to set and toughen. They are reeled up on revolving drums and later are cut into lengths and carbonized.

The glass bulb is made with two fine, platinum wires sealed into its lower end, to which wires the ends of the filament are attached. The upper end of the bulb is then softened and drawn to its proper shape, except that a small glass tube is fastened to it. This tube is connected to the air pump which exhausts the air. When the exhaustion is finished and while the bulb is still connected to the pump, the tube is heated at the bulb until it is soft and the end of the bulb sealed up, the end of the tube being cut off at the same time. This operation is the cause of the small pointed 'tip' on the end of each bulb.

The *Nernst lamp* is on the order of the incandescent lamp, but instead of a long thin carbon filament hermetically sealed up, it has a short thick 'glower' made of oxide of one of the rare metals such as zirconium, yttrium or thorium, which are highly refractory and have no power of conducting current unless previously heated.

The 'glower' is a small rod about one inch long. The current is unable to pass through it until it is heated. This initial heating is done by means of a small coil of platinum wire embedded in a fire proof covering and resting against one side of the glower. When current is turned on to the lamp, it first passes through this heating coil and heats the glower, which latter will rise in temperature until it becomes a conductor of very high resistance. Current then begins to flow through the glower, and is automatically switched off from the heating coil. The passage of current through the high resistance of the glower produces heat which raises the glower temperature to the point where it becomes incandescent.

The *Mercury Vapor,* or *Cooper-Hewett* lamp, is simply a glass bulb or tube having a small pool of mercury at its lower end. The air in the tube is drawn out and a vapor from the mercury, unmixed with air, fills the tube. One wire from the dynamo connects with the metallic mercury in the lower end, while the other dynamo wire connects with an iron plate inside the tube and placed at the upper end. Connections are made through the glass by means of platinum wires, sealed into the tube.

Currents of the ordinary pressure as used in illumination cannot pass through the tube until an initial spark or arc drawn in it is made. There are several devices for producing this initial or starting arc. One most used is to tilt the tube until the mercury makes a connection between the two dynamo terminals, by flowing to the upper terminal or an auxiliary terminal placed near the pool. The current easily passes over the metallic mercury path thus provided, and when the tube is tilted back in its normal vertical or diagonal position, the mercury flowing away from one terminal 'draws the arc' as has been explained (see section in this article *Arc Lamps*). Current then flows through the mercury vapor, and by reason of its resistance heats it until it becomes luminous.

The light emitted is without red rays and therefore all reds in various shades appear as dark purplish or a dirty black. It, however, produces a candle power of light with about one-eighth the energy required for equivalent light from an incandescent lamp.

Bibliography.—Cravath and Lansing, *Practical Illumination*; Louis Bell, *The Art of Illumination*; Houston and Kennelly, *Electric Incandescent Lighting* and *Electric Arc Lighting*; G. S. Ram, *The Incandescent Lamp and Its Manufacture*; J. A. Fleming, *Electric Lamps and Electric Lighting.*

ELECTRICAL MACHINES. *Continuous Current Dynamos.* As has been pointed out in the article ELECTRO-DYNAMICS (q.v.), a loop of wire rotating in a magnetic field will produce an electrical pressure; also, the greater the number of loops of wire connected in series so that their pressures add themselves together, the greater will be the total pressure generated; furthermore, if there be a large number of loops distributed in circular form around inside the polar space so that while some of the conductors are cutting magnetic lines at the maximum rate, some are

cutting lines at a slower rate and others in positions where they are cutting no lines at all at the instant under consideration, and if the ends of these loops be attached to a commutator having a large number of segments instead of two only, the current from such a device will flow in one direction only and it will not pulsate, varying from zero to a maximum, but it will be steady and of the same character as the current delivered by an electric battery. In order to obtain an intensely strong magnetic field, the loops or conductors are placed on a cylinder of iron which latter almost fills the space between the poles, there being just enough separation between cylinder and poles to allow the cylinder to rotate with good clearance. The distance from the field poles to the iron cylinder is called the *air gap*. The whole arrangement of rotating conductors and cylinder is termed an *armature*.

The elementary form of dynamo described in ELECTRO-DYNAMICS Fig. 4, possesses the disadvantage that the current generated in it by the motion of the loop in the magnetic field, though always flowing in one direction in the external circuit, is not absolutely continuous, but is a pulsating current consisting of two sharp impulses to every revolution of the coil. As these pulsations are evidently due to the coil moving alternately into and out of the positions of best and least actions in the magnetic field, it will be evident that if an additional coil is arranged at right angles to the existing coil, so that one coil is in the position of best action, whilst the other is in the position of least action in the magnetic field, the resulting current will be more nearly continuous. If a large number of additional coils are put in place a point will eventually be reached when the curves will become a practically straight line, and the resulting current will be continuous. It is upon this principle that direct current dynamos in practical use are constructed, a large number of coils being employed, suitably arranged upon an iron core, so that a large proportion of them are always actively cutting the lines of force, or moving in the positions of best action in the magnetic field.

Types of Armatures.—There are several different methods of arranging the coils upon the iron armature, but the object of all of them is to obtain practical continuity of the current. The types of armature in most extensive use for direct-current machines at the present time are the following: (1) the Ring or Gramme Armature, in which the coils are arranged upon an iron ring; (2) the Drum of Siemens Armature, in which the coils are arranged upon the surface of an iron cylinder or drum.

Each of these forms of armature has its special advantages, and in a general way it may be said that while the ring armature is more suitable for generating small currents at high potentials, the drum is better adapted for producing moderate potentials and large currents.

The Ring or Gramme Armature.—The principle of this armature is shown diagrammatically in Fig. 1. An iron

ring capable of revolving upon an axis is arranged in the magnetic field between the poles N and S of an electro-magnet. Upon this ring is wound a number of coils or loops of insulated copper wire, so as to cover the whole of the surface of the iron ring. The ends of each of the coils are connected to the ends of adjacent coils, so that a continuous closed helix is formed all round the ring; and at the points where connection is made between the coils, connection is also made to strips of copper which are insulated from each other, and arranged around the axis of rotation into a circular commutator, as shown in the figure. Against the two strips, situated at opposite ends of the diameter, press two metallic brushes, B1, B2, which, remaining stationary, serve to convey the current generated in the coils of the armature, to the external circuit E. The arrangement of the lines of force in the

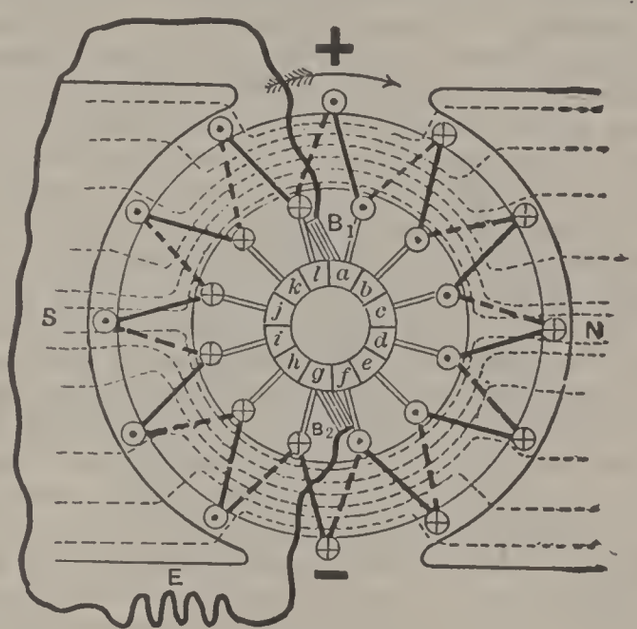


Fig. 1.

magnetic field between the two poles N and S, when the ring is inserted therein, is shown by the dotted lines in Fig. 1. From this it will be seen that the lines of force issuing from the north pole pass by way of the armature core to the south pole of the magnet, one half of the lines passing through the upper portion of the core, and the other half passing through the lower portion of the core. Owing to this peculiar arrangement, a very intense magnetic field is created between the outer surface of the armature core and the polar faces, while the interior space within the core remains almost entirely free from lines of force.

If the armature core be rotated in the direction of the arrow, the conductors, being fixed to the core will also rotate; and, moving in the magnetic field in the spaces between the outer surfaces of the ring and the two polar faces, they will cut the lines of force contained in this

magnetic field, and therefore pressures will be generated in each of the conductors. The directions in which these pressures act, as found by before given rules (see ELECTRO-DYNAMICS) is indicated by the dots and crosses marked upon the conductors in Fig. 1. The dots represent the direction of the pressures when acting from back to front or *towards* the observer, and the crosses indicate the direction when acting from front to back or *away from* the observer. As will be seen by this indication, in the conductors moving in the left-hand space the pressures are directed from the back of the armature to the front, while in all the conductors moving in the right-hand space the pressures are directed from the front to the back of the ring. As shown in the elementary form of armature described in article ELECTRO DYNAMICS, no pressures will be induced in the conductors moving in the spaces at the top and bottom of the ring between the two poles of the magnet, for these conductors are moving parallel to the lines of force, nor will any voltage be generated in the conductors arranged upon the interior surface of the armature, since these conductors are removed from the influence of the lines of force. These interior conductors, although inactive in the production of voltage, are essential for the connection of the various active conductors one to another. The coils shown upon the ring in Fig. 1 being wound right-handedly, it follows that the voltage induced in each of the conductors upon both sides of the ring will be added to that of the next above it; consequently the pressures in all the conductors upon each side of the armature will be directed from the bottom to the top of the ring, which will therefore have a higher or positive potential, while the bottom of the ring will have a lower or negative potential, as indicated by the signs in the figure. It will be apparent that if the coils were wound left-handedly, just the reverse would take place, the pressures being all directed from the top to the bottom; or the same thing would occur if the right-handed winding were retained, and the direction of rotation reversed. Since the total or resultant pressure of each side of the armature is equal to the sum of the pressures generated in each of the conductors arranged upon either side of the armature, it follows that if these latter are equal in number the resultant pressures will be equal and opposite; and, consequently, if the external circuit is open, no current will flow in any portion of the windings, the pressures merely giving rise to a difference of potential between the top and bottom of the ring. If the external circuit is closed, the current which results will flow up the windings on each side of the ring to the top brush, and from thence through the external circuit to the bottom brush, and thus complete the circuit.

The Drum or Siemens Armature.—This type of armature differs from the ring armature only in the manner in which the conductors are arranged upon the iron core. In the ring armature the core consists of a ring, and is

overwound with conductors passing along the outer surface and through the interior; in the drum armature, the core is in most cases a ring also, or may be regarded as a ring and is overwound with conductors passing along the outer surface, but in place of passing through the interior the conductors are carried completely around from one side over to the next. This form of winding is shown diagrammatically in Fig. 2, which illustrates what is known as a right-handed winding, with eight-part commutator. In the figure shown, the windings are supposed to be viewed from the commutator or front end of the armature. The windings passing along the length of the drum are represented by the small circles, upon which are marked the dots and crosses denoting the direction of the voltages induced in the conductors, as in the ring armature. The connections passing across the back end of the drum are represented by the dotted lines,

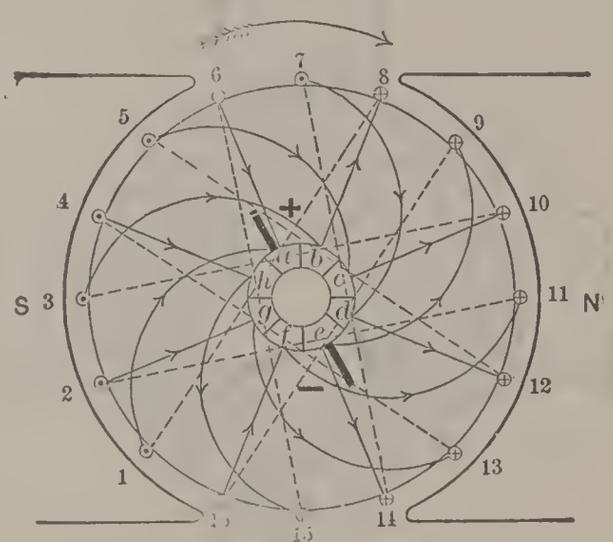


Fig. 2.

those upon the front end by the full lines. The manner in which the individual loops or coils are arranged and connected to each other and to the commutator, will be rendered clear by following the course of a single loop or coil upon the armature. Starting from the commutator segment (*a*), upon which the positive brush is resting at the upper portion of the armature, the conductor proceeds up the face of the drum to 6, thence along the top and across the back end to the lowest point of the drum, from thence it proceeds along the bottom of the drum to 15. From 15 the conductor is brought round the face of the drum and connected to the commutator segment (*h*), next to the one from which it started. Another coil starts from the segment (*h*), and follows a similar course upon the surface of the armature, and is connected to the segment (*g*), from which another coil starts, and so on all round the armature. A continuous closed helix is thus formed all round the armature, in a somewhat similar

manner to the ring armature. The paths of the lines of force in the magnetic field, when the armature is inserted therein, is similar to that of the ring armature; and with the armature rotating in the direction indicated by the arrow, it will be seen that the pressures and currents induced in the conductors, on either side of the armature, have the same relative directions as those induced in the conductors arranged upon the outer surface of the ring armature, the only difference being that the current flows across each end of the drum in place of flowing through the interior; the conductors at the ends being thus the only idle portions of the winding in the drum armature. With the particular winding shown in Fig. 2, i.e., a right-handed winding, the voltages will be directed from the bottom to the top of the armature, in a similar manner

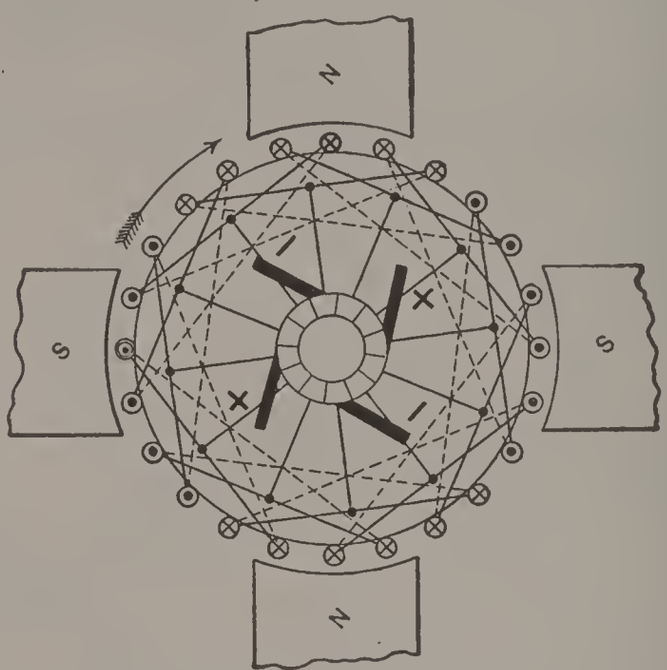


Fig. 3.

to the ring armature, the direction of the voltages being reversed by reversing the direction of rotation, or by employing a left-handed winding.

Multipolar Dynamos.—In practice it is found that although the ring and drum forms of armature, revolving in a bi-polar field, as described above, are suitable for moderate outputs up to about 50 kilo-watts, when larger outputs are required it is more economical to arrange the armature in a field composed of four, six, eight or more poles. In such machines the conductors are arranged upon the surface of the ring on drum cores so as to form closed windings as before, the only difference being that the number of neutral points, or points of collection of the current upon the commutator, is increased in proportion to the number of poles; and in the case of

drum armatures, that the loops or coils span a smaller proportion of the circumference of the armature. Referring to Fig. 3, which represents a drum armature rotating in a 4-pole field, it will be seen that the coils are arranged upon the core, and connected to the commutator in precisely the same manner as the bi-polar ring armature described above. The multipolar armature, as shown, differs however in the fact, that, when rotating, it produces two places at equal positive potentials and two places at equal negative potentials upon its commutator, at which the current may be collected, these points being indicated by the position of the brushes in the figure. To collect the current, the two brushes at equal positive potentials, and the two brushes at equal negative potentials, are connected together and to the external circuit.

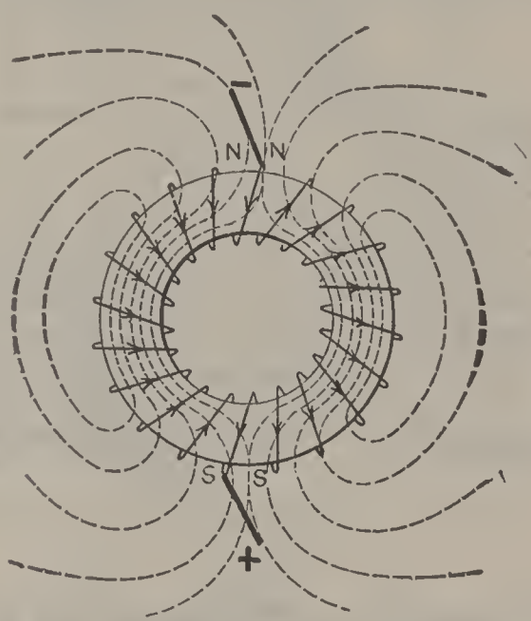


Fig. 4.

Distortion of the Magnetic Field.—As soon as the current begins to flow in an armature a number of reactions between the armature and magnetic field immediately take place. The chiefest of these reactions is the distortion of the magnetic field, and consequent shifting of the neutral points. This distortion of the magnetic field is directly due to the fact that the armature, when working, becomes itself an electro magnet, the poles of which exert an attracting or repelling force upon the magnetic field. The nature of this armature magnetism will be understood by reference to Fig. 4. It will be seen that the currents generated in the windings on each side of the armature, by its motion in the magnetic field, are flowing from the top to the bottom of the ring. On applying the rules given (see MAGNETISM) it will be found that these currents tend to produce north and south poles on each half

of the core at the points where the current enters and leaves the armature. There will thus be a north pole at the top of the ring, and a south pole at the bottom. The resultant effect of these two armature poles combined with the magnetic field is to twist the lines of force around into an oblique direction, as indicated in Fig. 5. Since, in order to secure sparkless collection of the current, and to obtain the greatest difference of potential between the brushes, it is necessary to place these latter at points situated at right angles to the direction of the lines of force in the armature, this twisting of the lines necessarily involves the shifting of the brushes round the commutator in the direction of rotation, otherwise some of the armature coils will be short-circuited by the brushes while actively cutting the lines of force, and considerable sparking at the brushes will result.

Eddy Currents.—Another very important reaction which occurs when the dynamo is working, is the produc-

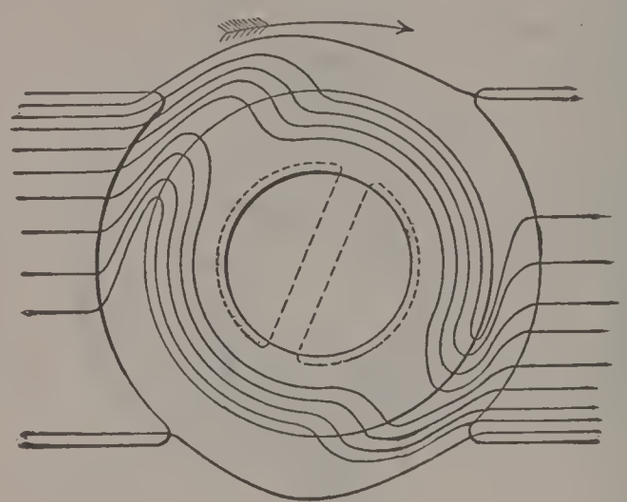


Fig. 5.

tion of eddy currents in different parts of the machine. This term is applied to the currents which are always produced when a solid metallic mass is rotated in a magnetic field, or is subjected to the action of a magnetic field which is undergoing change in its intensity or strength, for the reason that the currents generated always tend to flow in more or less circular paths. When produced in large solid metallic masses, the strength to which these eddy currents attain is frequently very considerable, owing to the low electrical resistance of the masses in which they flow; and in addition to consuming a large amount of energy, they frequently occasion a large and dangerous rise in the temperature. The cores of armatures being made of iron, are, unless suitably constructed, subject to the detrimental influence of these eddy currents, as is also the case with the conductors wound upon the core if these are of large cross-sectional area. To entirely prevent the generation of these eddy currents is impossible; they can, however, be prevented attaining any con-

siderable strength, by suitably interposing resistance in their path. With this object, the cores and conductors of armatures are *laminated*, or sub-divided into a number of small parts, each of which is electrically insulated from the other by some insulating material.

Field Magnets.—In all the foregoing descriptions and diagrams, only the poles of the field magnets have been

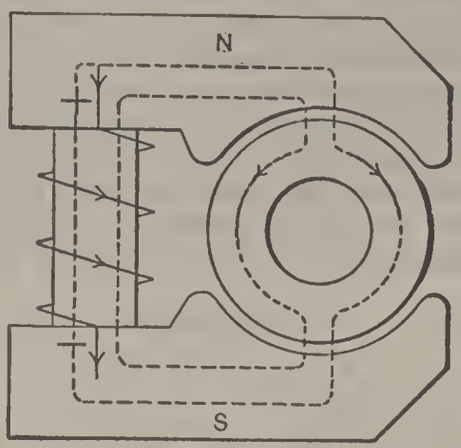


Fig. 6.

referred to or shown. The field magnets are, in reality very large and powerful electro-magnets.

Although innumerable forms of field magnets have been devised, they can all be arranged into two groups, viz., those in which the poles are 'salient,' and those in which the poles are 'consequent.' A salient pole is the term applied to poles which are produced at the ends of a bar

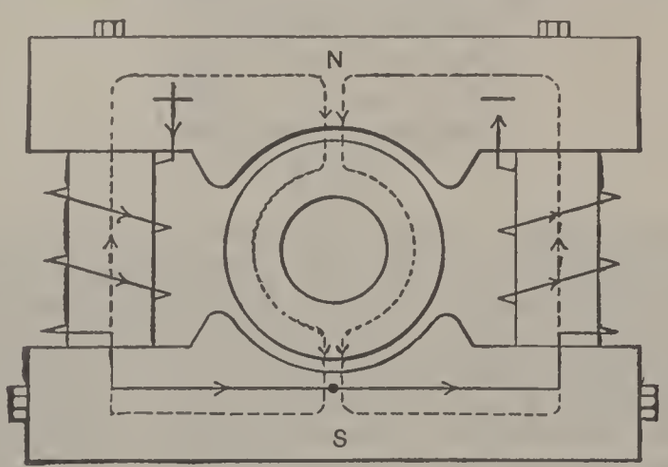


Fig. 7.

of iron, in distinction to consequent poles, which are produced in a continuous ring of iron.

Salient Pole Field Magnets.—The salient pole form of field magnet, being least costly to construct, is most frequently met with in practice. Fig. 6 shows its simplest form; in this arrangement only one magnetizing coil is required, this being wound upon the core, which is usually

of wrought-iron, let into and bolted to the cast-iorn pole pieces N S. The paths and directions of the lines of force, with the magnetizing current flowing in the direction shown, is indicated by the dotted arrow heads and lines.

Consequent Pole Field Magnets.—One form of consequent pole field magnets is illustrated in Fig. 7. The paths and directions of the lines of force in the field and armature cores are indicated, as before, by the dotted arrow-heads and lines. This is called the 'Manchester' type of field magnet and may be looked upon as a double magnet, the exciting coils being wound upon what may be regarded as the cores of the magnets. The directions of the electric current flowing in the magnetizing coils are such that two similar poles are produced in each pole piece.

Fig. 8 represents a very commonly used type of multipolar field magnet; it consists of a ring of iron, having

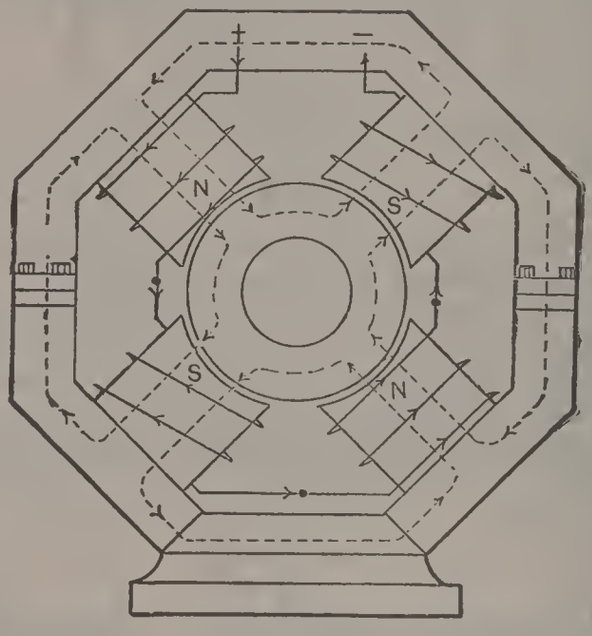


Fig. 8.

four pole pieces projecting inwardly, around which the exciting coils are wound, the ring forming a common yoke for all the poles. Usually, it is made in two portions, bolted together horizontally, so that the upper portion may be lifted off for examination of the armature. As a rule, the wires which are wound to form the magnetizing coils are wound upon insulated spools, which are afterwards slipped over the limbs of the magnet; in some cases, however, they are wound direct upon the core of the field magnet, this latter being previously insulated with vulcanized fibre or other insulating material.

Field Windings.—The current to energize or magnetize the field magnets is usually taken from the dynamo itself in the case of direct current dynamos. There is always a small amount *residual magnetism* of the field poles, i.e., the feeble magnetization left in the iron after it was first magnetized, due to the retentivity of the iron which ex-

ists to some extent in nearly all classes of commercial iron. When the armature begins to rotate, a correspondingly feeble pressure is produced. This sends a slight current through the field windings, and this strengthens the field. A stronger pressure results which in turn more strongly magnetizes the poles, and this mutual action—called 'building up'—proceeds until the full pressure and excitation are reached. The time required to 'build up' varies from five seconds to half a minute.

There are three forms of so-called *self exciting* dynamos which are: (1) Series Wound Dynamos; in which the coils of the field magnet are connected in series with the armature and external circuit. (2) Shunt Wound Dynamos, in which the coils of the field magnet form a shunt to the armature and external circuits, and, being composed of many turns of fine wire, absorb only a fraction

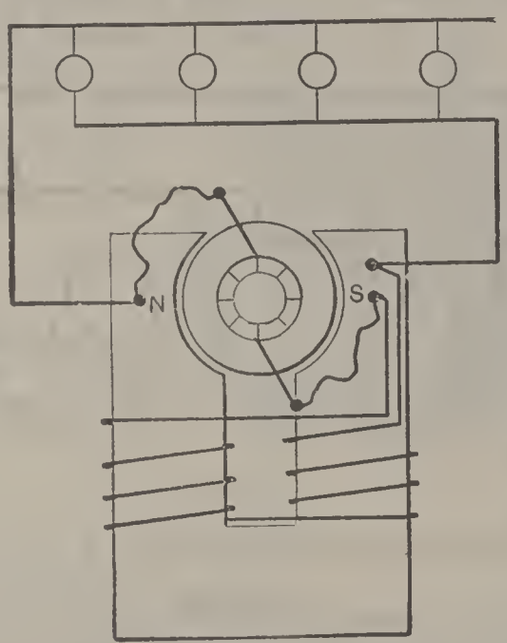


Fig. 9.

of the total current. (3) Compound Wound Dynamos, wherein two coils are wound upon the field magnets, arranged in a combination of shunt and series, one coil being wound with a large number of turns of fine wire, and connected as a shunt to the armature; the other being composed of a few turns of thick wire, and connected in series with the armature.

Series Dynamos.—The manner in which the connections of the series wound dynamo are arranged is shown in Fig. 9. The coils of the field magnet are wound with a few turns of thick insulated wire, and being joined in series with the armature, the whole of the current generated in latter passes direct through them, and thence to the external circuit. The current in passing through the coils of the field magnet energizes the latter, and creates a magnetic field between the two poles N. S., in which the armature revolves. A little consideration will show

that the strength of this magnetic field, and therefore the voltage of the machine will vary in direct proportion to the current flowing in the external circuit, since this current is also the magnetizing current. If the external circuit is 'open,' no current will flow therein, and therefore the field magnets will be unexcited, and the only magnetic field will be that due to the residual magnetism of the field magnets; the voltage of the machine will, therefore, be practically nil. If, on the other hand, the external circuit is closed, so as to offer a minimum resistance, or 'short circuited,' the field magnet will be excited to the greatest extent, and the pressure and current flowing in the external circuit, will be a maximum.

Shunt Wound Dynamos.—The shunt wound dynamo differs from the series wound machine, in that an independent circuit is used for exciting its field magnet. This circuit is composed of a large number of turns of fine insulated copper wire, which are wound round the field

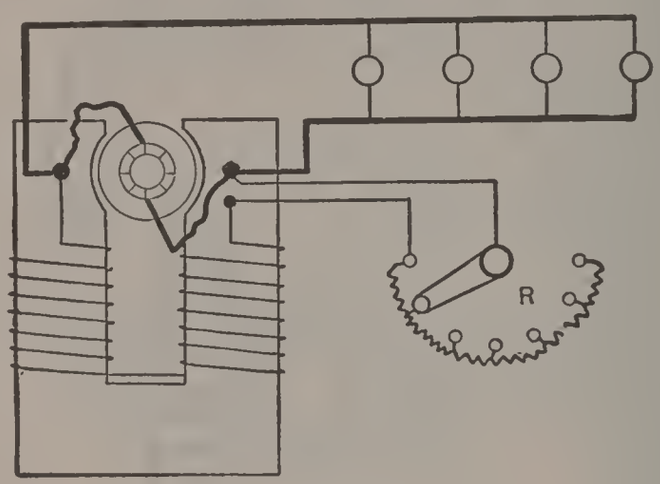


Fig. 10.

magnet and connected to the brushes, so as to form a shunt or parallel circuit to the brushes and external circuit. Fig. 10 shows the connections of the shunt wound dynamo, from which it will be seen that two paths are presented to the current as it leaves the armature, between which it divides in the inverse ratio of the two resistances. One part of the current flows through the magnetizing coils, the other portion flows through the external circuit. In all well designed shunt dynamos, the resistance of the shunt circuit is always very great, as compared with the resistance of the armature and external circuit, and the strength of the current flowing in the shunt coils rarely exceeds 4 per cent. of the total current.

Compound Wound Dynamo.—In the shunt dynamo the pressure falls off slightly with increasing current output, due to increasing armature reaction and voltage drop which is caused by the use of part of the electrical pressure generated to force the current through the armature windings. When supplying lamps and motors over a

long line of wire, there is considerable voltage drop in the line itself which, of course, increases with increase in the current.

Therefore, in order to maintain a constant pressure at lamps or motors, the voltage generated must increase with increase of current so that the increasing 'drop' is just neutralized.

By putting on a shunt winding to give the proper voltage at no load, i.e., when no current is taken from the dynamo; and in addition a few series turns, such that with the maximum dynamo current passing through the series windings the excitation of the field magnets will be increased by an amount equal to both the armature drop (or internal drop) and the line drop (or external drop), a constant potential will be maintained on the lamps and motors. Such dynamos are termed compound wound, their field

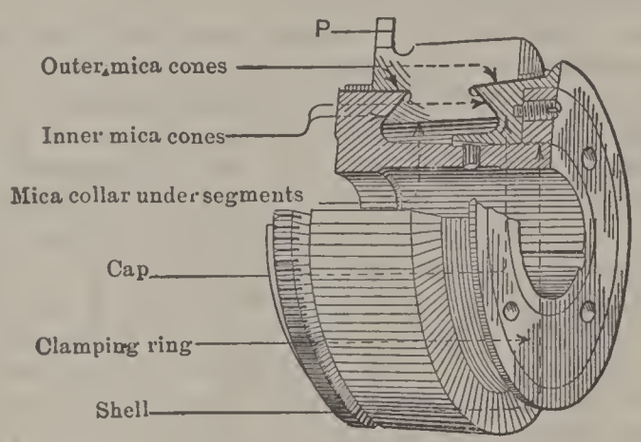


Fig. 11.

excitation partaking of the characteristics of both shunt and series windings.

Field Control.—In Fig. 10, R is a rheostat which is put in series with the field winding. This is a number of resistances connected in series, with a contact arm which may be moved by a wheel or a handle. The contact arm, as it moves from one resistance connection to the next cuts in or cuts out that resistance connected to the contact point moved over. In other words, movement of the arm varies the resistance of the rheostat and thereby varies the excitation of the field magnets. In this way the potential of the dynamo may be varied, within limits, as may be desired.

The commutator and brushes of direct-current dynamo electric machines are most important features and their principal details are therefore given below:

Commutators.—A commutator consists of an assemblage of drop forgings, or castings of copper called segments, Fig. 11, which are thoroughly insulated from each other. These segments are assembled around a tube. The tube is threaded at both ends to receive nuts to hold the segments together. Mica is usually employed to insulate the

segments from each other, from the nuts, and from the tube. In addition to its high insulating properties, mica possesses the advantage that it wears under the brushes at about the same rate that copper does. This maintains a smooth surface at all times upon the surface of the commutator. The maximum voltage between adjoining segments is seldom allowed to exceed 20 volts. Assuming that the voltage is uniformly distributed, a 240-volt machine with a closed winding would therefore have 12 bars between adjoining brushes, or for a 2-pole machine 24 commutator segments. In Fig. 11 the perpendicular projection, P, of the commutator segment protects the coils on the armature, and is made to receive the extremities of the coils of the armature windings. The wires in some cases are fastened to the lugs, P, with set-screws and then soldered. The commutator complete is keyed to the armature shaft.

Brushes.—Carbon and copper are the two materials usually selected for brushes; carbon for high potential machines and copper for low potential machines. When a coil is entering commutation it has a current of electricity flowing in it. The direction of this current changes when the coil is commutated. The current flowing in the coil before commutation tends to keep up because of its self-induction. In the time it takes a strip of insulation to pass under the brush, the current flow in the coil must be stopped, and a current of equal value started in the opposite direction. Both operations may be done by counter E. M. F., or the current flow may be stopped by a high resistance and started by fringe flux. The transition resistance of brush to commutator usually causes a fall in the potential of about one volt for every brush. The pressure of the brushes against the commutator varies, and the average value is about $1\frac{1}{4}$ pounds to the square inch. The necessary area of rubbing surface of carbon brushes is one square inch for 40 amperes, and copper brushes permit of 200 amperes for the same cross-section.

Consult: Lunmis-Paterson, *Management of Dynamos*; Silvanus P. Thompson, *Dynamo Electric Machinery*; R. M. Walmsley, *Modern Practical Electricity*; Samuel Sheldon, *Dynamo-Electric Machinery*; J. Fischer-Hinnen, *Continuous Current Dynamos*; F. M. Weymouth, *Drum Armatures and Commutators.*

Continuous Current Motors.—If the armature of a continuous current dynamo machine is made to rotate, currents are produced in the coils of the armature which may be utilized for the excitation of the electro-magnets, and for other purposes in an external circuit. The machine, therefore, converts mechanical work into electric energy. If the reverse process be now adopted, i.e., if the terminals of such a machine are connected with conductors from a generator of continuous currents, the currents of the latter will have to pass through the coils of the machine, the electro-magnets of it will be excited, and will influence the coils of the armature. The armature will then begin

to rotate, and will continue to do so as long as the currents from the source of electricity flow through the coils of the machine. This motion of the armature can be transmitted to any machine which is required to do mechanical work. In this case the electric energy is converted into mechanical work, or the exact reverse of the first case. This property of dynamo-electric machines to convert mechanical work into electric energy and electric energy into mechanical work, is expressed by saying that 'the dynamo is a reversible machine.' The cause of this rotation of the armature is the magnetic drag set up when current is passed through a wire that is in a magnetic field.

Whenever a conductor carrying an electric current lies in a magnetic field across the direction of the magnetic lines, it experiences a mechanical force. This force always tends to drag the conductor sideways out of the

Fig. 12.

field, and acts in a direction at right angles to the magnetic lines and at right angles to the conductor itself. Rules for remembering the relation between the directions of the magnetic lines, the current, and the resulting forces have been given in ELECTRO-DYNAMICS. In a motor it is this drag on the conductors which drives the armature mechanically. In a dynamo the drag acts against the driving power of the steam-engine and opposes the rotation.

The drag of a magnetic field upon the conductor that carries a current may be considered from the magnetic point of view. As has been pointed out, such a conductor is surrounded by a whirl of magnetic lines. Around a long, straight, conducting wire not placed in any magnetic field, these magnetic lines form a system of concentric circles (see MAGNETISM and ELECTRO-DYNAMICS) which are close together near the conductor, and wider apart at a distance away, resembling Fig. 12 in general disposition.

If the current is coming towards the observer, or up, in the figure, which shows a cross-section of the conductor,

the positive direction along the magnetic lines will be left-handed or counter-clock-wise. If now such a conductor be placed in a uniform magnetic field—one, for example between a large north magnetic pole on the right and a south magnetic pole on the left, a compound field will be produced, due to the blending of the magnetic lines of the conductor with those of the field. In considering this distorted magnetic field it should be remembered that the mechanical actions that result may always be known by supposing the magnetic lines to act as elastic cords tending to shorten themselves. There is in fact a tension along the magnetic lines and a pressure at right angles to them, both proportional at every point to the square of their density. A mere inspection of the lines of Fig. 13 will accordingly show that there will be a result-

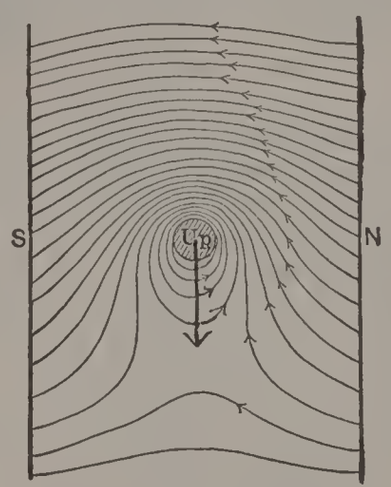


Fig. 13.

ant drag upon the conductor in the direction shown by the dotted arrow.

This then explains both the *resistance to motion* offered by a dynamo armature, and the *cause of motion* in a motor armature.

Another important action of the motor is its generation of a *counter pressure* or *counter electro-motive* force.

As has been previously pointed out, any cutting of magnetic lines by a conductor, produces an electrical pressure, no matter how the cutting may be effected. Obviously, the armature of a motor rotating in a magnetic field, differs in no wise from that of a dynamo, and, conquently, a voltage or pressure is produced in the motor armature, proportional to the speed, number of armature turns and strength of the magnetic field. This pressure *opposes* the flow of current from the dynamo or battery supplying energy to the motor. The voltage of the source of supply must be greater than the counter voltage of the motor, the excess being sufficient to send the current through the motor windings overcoming the resistance. For instance assume that a dynamo giving a pressure of 125 volts supplies 20 amperes to a motor. If

the resistance of the wires leading from the dynamo to the motor is 0.3 ohm, and that of the motor armature is 0.7 ohm, the pressure necessary to force 20 amperes through the wires is I R—20x0.3 = 6 volts. Therefore *the pressure at the motor brushes* is 125—6 = 119 volts. The pressure required to send the 20 amperes through the motor armature is 20x0.7 =14 volts. Deducting this from the 119 volts leaves 105 volts, unaccounted for. This is just equal to the counter pressure produced in the motor armature. The *power* of a motor is equal to its *counter pressure* multiplied by the amperes passing through its armature. For the above case, the power would be 105x20 = 2,100 watts or (dividing by 746) 2.82 horse power.

The power put into the motor from the generator is 119 volts x 20 amperes = 2,380 watts. Therefore 280 watts are lost in the conversion of the electricity to mechanical power. This loss goes into heating the coils, commutator, brushes and other parts traversed by the current, just as in a dynamo. All electrical machines and devices become warm after operation for a short period.

The *efficiency* of a motor is the ratio of the energy supplied by the motor to the energy supplied to the motor. Thus for 2,380 watts input and 2,100 watts output the efficiency is $\frac{2,100}{2,380}$ = 88.4 per cent.

Speed Regulation.—From the foregoing it is evident that if the field strength of a continuous current motor be *decreased* its armature speed will *increase,* for a decrease in field strength will reduce the counter voltage and a larger current will flow through the armature because of this decrease in the pressure opposing the flow. The increased current strength then causes the motor to increase its speed until it generates a sufficient counter pressure to limit the inflowing current to the amount required to give the necessary power. All methods of speed variation are based on change in field strength.

Motor Field Windings.—Just as generators may have their field magnets energized by series, shunt or compound windings, so may motors also be excited or energized. Figs. 9 and 10 representing series and shunt dynamo connections respectively, also show corresponding motor connections. The characteristics of the two forms are very different however, and each type is especially suited to certain conditions.

Any motor when starting from rest at the first instant when current is turned on, has no counter pressure, the armature being at rest; consequently, the full pressure of the incoming current acts to send electricity through the windings and being opposed only by the low resistance the current 'rush' would be abnormally great and injure the motor if some external resistance were not connected in series with the armature. Also the stronger the field, the more quickly will the motor come up to a speed at

which the counter pressure chokes back the current and reduces it to its proper amount. Therefore in starting motors the field is most strongly magnetized and a resistance which may be varied is connected in the armature circuit and it is gradually reduced and finally cut out altogether when the motor attains its proper speed.

The Series Motor when starting exerts a very strong *torque* or turning effort because the heavy initial currents pass through the field windings as well as the armature. This produces an abnormally strong field which with the large armature current gives the strong torque. This motor, therefore, is particularly suited for driving cars, elevators and the like, where a large power is needed for a fraction of second to start them from rest. If the series motor is only lightly loaded, however, its speed will increase, and the increasing counter pressure will decrease the current flow. This again weakens the field which produces a further increase in speed, and the process continues until a speed is reached at which the armature may fly to pieces. Therefore a series motor may never be run without sufficient load to keep its speed within safe limits. *The shunt motor*, on the other hand, has a field which is constant regardless of the change in load, and it will therefore run at a practically constant speed no matter what the load or if there be no load at all on it. The starting effort however, is not so great as that of the series motor. The shunt motor is therefore best suited to driving machinery in mills and factories, where it comes up to speed slowly on starting and maintains a constant speed during the time of its operation.

The speed of series motors is changed, by varying the number of turns in the field winding through which the current passes, thereby changing the ampere turns.

The speed of a shunt motor is regulated by changing the current through the field winding, which is effected by varying the resistance of the rheostat in series with the field (see Fig. 10). Consult the same works recommended under section *Continuous Current Dynamos* of this article.

Alternating Current Dynamos.—Single Phase Machines.—If an iron core—either drum or ring type—be wound with wire in the same manner as described in the foregoing article on direct current dynamos, and connection be made with two points only of the winding, these points being diametrically opposite to each other and one connection leading to a ring on the shaft while the other connection leads to a similar ring, brushes pressing against these rings will convey alternating currents to any outside circuit connected to them. The form of the pressure and current waves produced, will be practically similar to those shown in Fig. 13 in the article ELECTRO-DYNAMICS. The general case of the production of an alternating pressure is also discussed in that article.

The reason why the pressure will be a maximum at one instant, decrease to zero, rise to a maximum in the opposite direction and decrease again to zero, when the

armature windings extend completely around the circumference of the core, even though some of the conductors are always cutting the magnetic lines, lies in the fact that when the diametrically opposite points to which the collector rings are connected, are in a position such that a line drawn from one to the other is at right angles to the magnetic field in which the armature rotates, the pressures generated in either half of the windings combine to produce the maximum pressure.

When the armature has rotated through 90 degrees so that a line drawn from one connecting point to the other is *parallel* to the magnetic lines of the field, the pressures in the two halves, while being as great as before, *oppose* each other and the resultant pressure at the connecting points is zero. The effect, therefore, is identical with that of the loop as indicated in Fig. 2, and described in the article ELECTRO DYNAMICS, except that the maximum and, therefore, the effective pressures are greatly

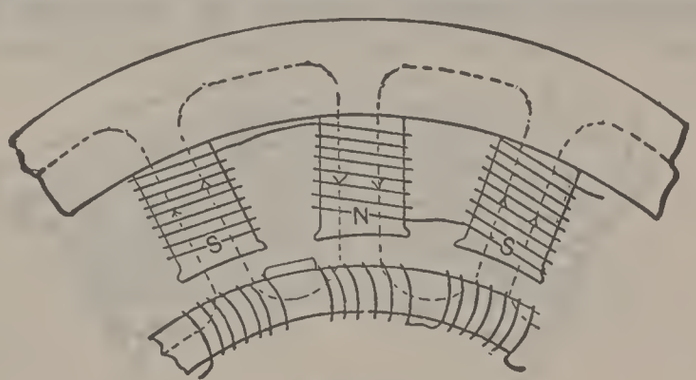


Fig. 14.

increased by reason of the large increase in the number of turns on the armature.

Alternators, or alternate-current dynamos, may be classified in three sorts: (1) Those with stationary field-magnet and rotating armature; (2) Those with rotating field-magnet and stationary armature; (3) Those with both field-magnet part and armature part stationary, the amount of magnetic induction from the latter through the former being caused to vary or alternate in direction by the revolution of appropriate pieces of iron, called inductors.

The forms of winding may further be classified as *pole* windings and *distributed* windings.

Pole wound machines are constructed as shown in Fig. 14. In this form, the outer ring has inwardly projecting poles on which are placed the field windings as shown. The armature is wound either on a gramme ring as indicated or a drum armature may be used.

The arrangement may be reversed and the armature windings put on the outer ring while the field windings are placed around polar projections on the rotating portion of the machine, in which case, the armature is stationary

and the wires leading from it connect directly to the ends of the armature winding, while the two ends of the field winding are connected to the collector rings. The only current passing to the collector rings then is the magnetizing current to excite the field windings. This type of machine is called the *revolving field alternator.*

The *inductor alternator* has both its field and armature windings stationary, and the electrical pressure is generated by revolving part of the magnetic circuit. There are many varieties of machines built on this principle. Fig. 15 shows one form which illustrates the general principles.

A ring R having a large number of internally projecting poles is entirely built up of laminae or sheets of soft iron. The alternate poles 2, 4, 6 are wound with coils to serve as armature parts, whilst those between them 1, 3, 5 are wound with other coils to act as the magnet part. Upon an internal wheel are borne masses of laminated iron P, called inductors, which in rotating produce rapid periodic reversals in the magnetic polarity of the cores of the

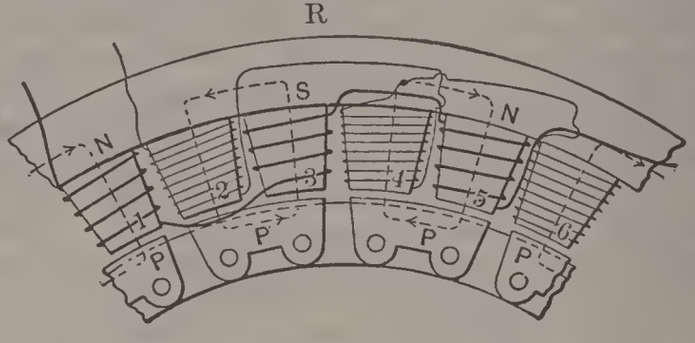


Fig. 15.

armature parts, and set up alternate currents in the coils that surround them.

Obviously when the wheel or rotor is in the position shown; the lines of force through armature winding 2, pass from field pole 3, through the inductor P. Pole 3 being a south pole, pole 2 is a north pole, the coil on 3 magnetizing this local magnetic circuit. Likewise for the same reasons, pole 4 is a south pole.

Imagine the rotor to have moved to a position where one inductor P is under poles 1 and 2 while another is under poles 3 and 4. Pole 2 now becomes a south pole receiving as it does its excitation from the north pole winding 1, while pole 4 has become a north pole because it is now excited by the south pole winding 3. Thus, the polarity of the field windings remains unchanged, while the polarity of the lines through the armature winding reverses from positive to negative. In doing this they alternately must spring out, collapse, and spring out again in an opposite direction thereby cutting the coils of the armature windings and producing an electrical pressure.

Distributed Windings for armatures are principally used now. These are modified polar windings usually placed on

the inside surface of the stationary outer ring. A large number of small notches or slots are cut inside the ring so that it has the general appearance of an internal toothed gear wheel. The windings are placed in these slots, each coil being subdivided so that part of it rests in one pair of slots, part in another and part in a third pair, this subdivision being varied according to the requirements of the case.

The field windings for such generators, are placed on outwardly projecting poles which are affixed to the rotating wheel inside the outer armature ring.

Exciting Current.—Since these generators produce alternating curent only, and the current for magnetizing the field must be continuous current; small continuous current dynamos must be used to supply the required magnetizing current. These field magnetizing dynamos are called *exciters,* as they are said to 'excite' the field magnets of the alternating current dynamos. Their size has only to be great enough to supply the number of watts used in the alternator field windings. These ex-

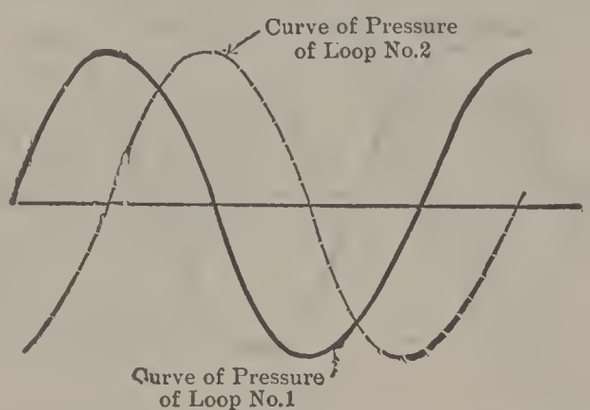


Fig. 16.

citers may be driven by belts or gears from the shaft of the main generator and, in some instances, the armature of the exciting dynamo is mounted on the same shaft as that on which the rotating part of the alternating current generator is placed.

Multiphase Machines.—Referring to Fig. 2 in article ELECTRO DYNAMICS it is obvious that if a second loop be fastened to the shaft A A, so that it lies in the magnetic field and is always at right angles to the first loop, alternating pressures will also be produced in it, as the shaft is rotated and, if another pair of collector rings be also affixed to the shaft, to which the ends of this second loop are connected, a second alternating current quite independent of that produced in the first loop, will be generated. It is also clear that the *phase* of the two loops will be different, for the first loop will have its two conductors at the extreme upper and lower points in its path, cutting no lines of force and its pressure consequently zero, while the other loop will have its two conductors at opposite sides of the field, 90 degrees from the

upper and lower points, this position corresponding to the most rapid cutting of lines of force and therefore the maximum generation of electrical pressure. Hence the pressure in the first loop is zero when that in the second is a maximum, and it also follows that the pressure in the second loop is zero when that in the first is a maximum.

Plotting out these two pressures to the same scale and on the same datum line, they appear as shown in Fig. 16. The dotted and full curves show the pressures in the first and the second loops respectively. From this it is seen that the two pressures are at 90 degrees to each other, that of the first loop being 90 degrees behind that of the second. This arrangement constitutes an elementary *two-phase* dynamo.

If three loops were arranged in a magnetic field spaced 60 degrees apart the phase or time relation between the instant when the pressure of one loop would reach a maximum and that of the next succeeding one reaches

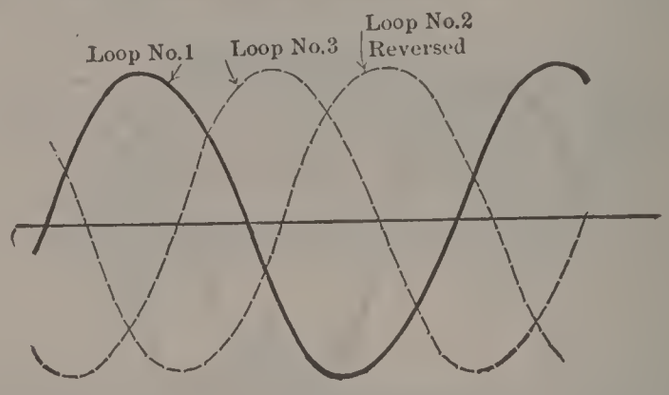


Fig. 17.

its maximum would be 60 degrees. If each loop were provided with its pair of collector rings, three separate, alternating currents could be taken from the machine, differing by 60 degrees in phase. If the end connections of one of the loops be *reversed*, the pressures produced will differ in phase by 120 degrees. Such an arrangement constitutes an elementary *three-phase* dynamo and if its pressures be plotted to show their rise, fall and reversal with time or the angle turned through, they will appear as indicated in Fig. 17.

It would appear necessary to have three pairs of collector rings, brushes and wires to take the three currents from a three-phase dynamo. Such however, is not the case. If three similar ends of the three loops be connected together and the remaining three ends connected to collector rings, only three rings, brushes and wires are required to complete the circuits of all three loops. Refer to Figs. 18 and 19; *a*, *b* and *c* represent either the three separate loops or the complete dynamo windings as they occur in practice. In Fig. 18 similar ends of *a*, *b* and *c* are joined together, their free ends leading to the lines

1, 2 and 3 respectively. This arrangement is called the *star connection*. The pressure between any two of the wires 1, 2, 3 is $\sqrt{3}$ x pressure generated in any one of the windings, *a*, *b* or *c*, while the current flow in any line is equal to that in the armature winding to which it is joined.

When pressure in *b* is maximum and positive, those in *a* and *c* are negative and between maximum and zero. Current flows therefore out from the dynamo on wire 2, and returns on wires 1 and 3, the sum of the currents in these two being equal to the outgoing current in wire 2 As rotation proceeds the wires act alternately as out going and return conductors, it being a peculiarity of the three phase current that only one wire per phase is required. This follows from mathematical consideration of the combined curves of currents in the three windings which shows their sum to be zero, i.e., the sum of the positive currents in the wires is at any instant to the sum of the negative currents.

The *mesh* or *delta* connection is shown in Fig. 19. In this, the opposite ends of the three loops (or windings)

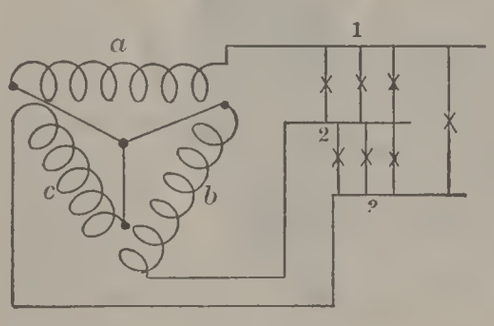


Fig 18.

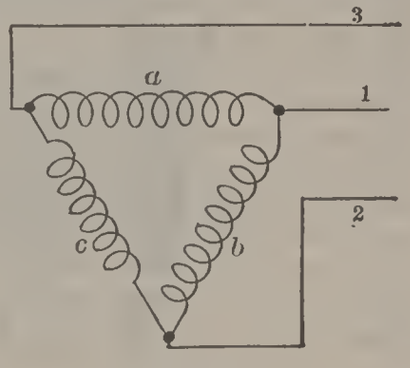


Fig. 19.

are joined together and the three collector rings connected to the common junction points. The *pressure* between any two line wires in this case is equal to that generated by any one of the three windings while the *current* to any line is equal to $\sqrt{3}$ x current through any one of the three windings.

Multiphase (two or three phase) generators are used to supply current to various devices but principally for rotary converters and induction motors.

The advantage of the three phase over the two phase systems lies in the ability to omit some of the wires as before explained, and the cost of wire for a given distance of transmission at a certain voltage is only three-fourths that required for the single or two phase systems.

Consult: Sheldon and Mason, *Alternating Current Machines*; Franklin and Williamson, *Alternating Currents*; D. C. and J. P. Jackson, *Alternating Currents*; C. P. Steinmetz, *Elements of Electrical Engineering*, and *The Theory and Calculation of Alternating Current Phenomena*; Silvanus P. Thompson, *Polyphase Electric Currents*.

Transformers.—The alternating current transformer is a device for changing electricity of high voltage and small current to low voltage and large current or *vice versa.* The energy supplied to the transformer and that given out by it are approximately equal, the output being somewhat smaller than the input,—from 3 to 5 per cent. less—on account of the energy losses from hysteresis and heating of windings by the current which traverses them.

The general arrangement of transformers is as shown in Fig. 20. They comprise a complete magnetic circuit of soft iron, laminated to reduce eddy currents, and having two coils of insulated wire wound around this iron core. When alternating current is supplied to one of coils the rise, fall and reversal of the current produces a corresponding rise, fall and reversal of magnetic lines through the iron path, and, since these lines thread through the other or secondary coil, their continual variation in magnitude and direction produces an alternating electrical pressure

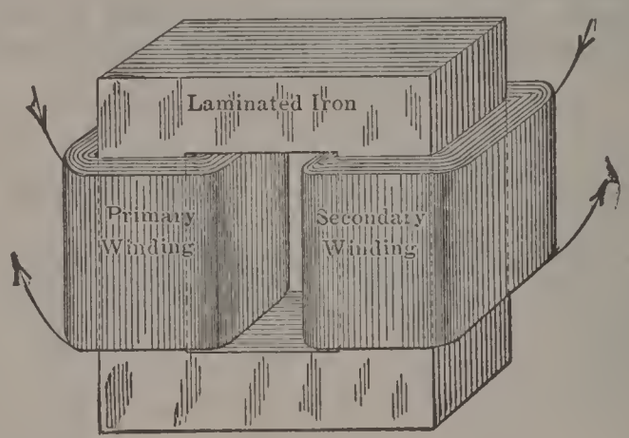


Fig. 20.

in this coil, the principle being the same as that of the induction coil previously described. Thus, though there is no electrical connection between the primary and secondary windings, current may be taken from the secondary when another current is sent through the primary. In fact, the transformer may be considered as a form of dynamo, in which the primary coil is the field winding, the secondary coil, the armature winding and the cutting of magnetic lines produced by variation of the magnetization instead of by rotation or movement of the conductors.

The self induction of the primary coil, being as it is, wound about an excellent magnetic circuit, is very high and when no current is taken from the secondary, the counter pressure of the primary is nearly equal to the pressure of the incoming current. Therefore, very little current can flow through the primary winding even though it be always directly connected to the alternating current generator, unless current be taken from the secondary. As current is taken from the secondary, the

primary current increases, the primary and secondary currents always bearing an approximately constant ratio between them. The explanation of this action lies principally in the change in the self induced pressure in the primary winding which takes place when current is taken from the secondary winding. The self-induced pressure in the primary, which opposes the inflow of current from the generator, is produced by the magnetic lines set up in the iron magnetic circuit. The current flow through the secondary also has an effect on the magnetic circuit and it sets up a magnetizing force *in opposition* to the magnetizing force of the primary. Therefore, as current is taken from the secondary the number of magnetic lines is somewhat reduced, and likewise the self-induced pressure in the primary is reduced, allowing a greater flow of current from the generator to the primary.

This, however, is only a partial explanation of the total effect, the complete exposition of which is somewhat more complicated and resides in the change in the *phase or time* relations.

At certain instants the counter pressure of self-induction is very high and correspondingly opposes the inflowing current. If current be taken from the secondary the phase is shifted, i.e., the counter pressure of the primary which was high at one instant becomes low at that same instant, its high point being shifted to some later position in the cycle. Thus the *effective value* of the self induced pressure may change but little, but its times of maxima and zero may occur at such instants that it does not effectively oppose the incoming current and, at some instants, may actually assist its flow. Hence the amount of current that may flow through the primary, is varied with the current which is taken from the secondary.

The pressure produced in the secondary bears the same ratio to the pressure on the primary as the number of turns in the secondary coil is to the number in the primary.

The transformer may be used to raise or to lower the voltage. In the first case it is called a '*step up*' and in the other a '*step down*' transformer.

The *resistance* of transformer windings is very low, the factor limiting the current flow being the counter pressure of self induction. Therefore, if a continuous current, having the same pressure as the alternating current for which the transformer is designed, be connected to the transformer windings an enormous current flow will result, and the transformer insulation burned up, there being no self induction with continuous currents after the first instant of making or breaking the circuit.

Consult: J. A. Fleming, *The Alternating Current Transformer;* C. P. Steinmetz, *The Theory and Calculation of Alternating Current Phenomena*, and *The Theoretical Elements of Electrical Engineering;* Franklin and Williamson, *Alternating Currents.*

Synchronous Motors.—Motors of this class operate from alternating currents and the electrical speed of these

motors, i.e., the time required for any armature conductor to move from one pole to the next adjacent pole is exactly the same as that of the alternating current generator which supplies current to the motor. Thus, if a generator has 12 pairs of poles and supplies current to a synchronous motor having four pairs of poles, the armature of the synchronous motor will make three complete rotations for each single rotation of the generator. In each case, any conductor on the motor armature travels past 12 pairs of poles while any conductor on the generator armature, similarly, travels past the same number of pairs of poles. Thus it is clear that the reversals in electrical pressure in the generator are met at each alternation by counter pressures in the motor armature which reverse at equal times or synchronously with the generator pressures.

Fig. 2, in article ELECTRO-DYNAMICS shows a single loop rotating in a bi-polar magnetic field. In the position shown, let it be assumed that the alternating current from the generator enters collector ring No. 1, passes through the upper conductor of the loop, down the back connecting wire, coming from back to front in the lower conductor of the loops and through collector ring 2 back to the dynamo. The drag produced by the current tends to urge the upper conductor downward and the lower conductor upward, as is evident from previous explanations of the action of currents in conductors which are placed in magnetic fields. This action, produces a turning effort, causing the loop to rotate about the shaft, A A. When the upper conductor reaches the lower position and the lower conductor has turned to the upper position, the current from the generator reverses at that instant, changing the direction of flow through the loop and thereby again causing a magnetic drag on the conductors, tending to rotate the loop continuously in the same direction.

Obviously, the counter pressure generated by the rotation of the loop in the magnetic field will be of the ordinary alternating current form, as explained in the article ELECTRO-DYNAMICS and will rise, decrease, reverse and return to zero, always in exact opposition, to the variations in the generator pressure. Thus the electrical speed of the synchronous motor must always be exactly the same as that of the generator and this speed relation is as absolutely fixed and rigid as if the generator and synchronous motor were connected together by gear wheels.

No variation in the field magnetization can possibly affect the speed, as is possible with direct current motors.

Like alternating current generators, the field magnet must be energized from some source other than the alternating current fed to it, usually from a small direct current dynamo.

These machines have no power to start themselves from rest, but must be brought up to synchronous speed by some external means. In some cases, this is done by

means of a small starting motor attached or geared to the shaft of the synchronous motor.

Consult same works as given under section *Alternating Current Dynamos* in this article.

Rotary Converter.—Alternating currents may be changed to continuous currents and *vice versa* by means of the rotary converter.

Fig. 21 illustrates the principle on which this machine is constructed. In the drawing, the revolving armature is shown as a simple coil with a two-part commutator for the continuous current connections; but in practice a more complex armature with a many-part commutator is employed. For example, an ordinary drum or ring armature is used, with the addition of two slip-rings, which are conducted to two points 180° apart. It will serve as a transformer either way. It is clear that if alternating current be supplied to the brushes bearing

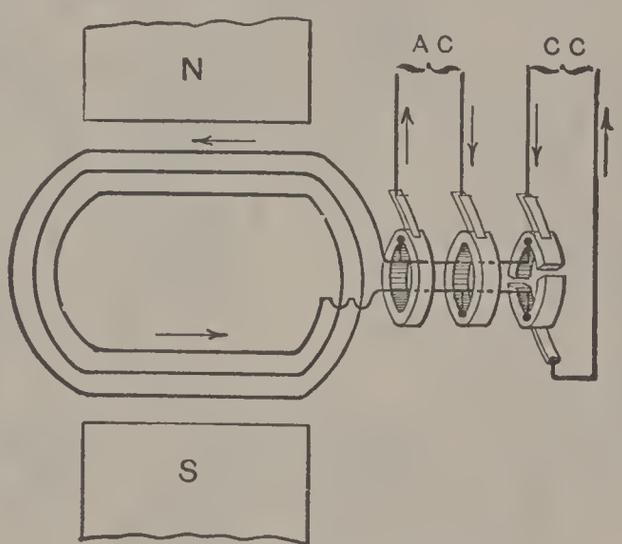


Fig. 21.

on the collector rings, the loop will rotate as a synchronous motor. The rotation will produce the usual effect of a loop having its ends connected to a commutator and rotated in a magnetic field, a continuous electrical pressure is produced at the commutator brushes and continuous current may be taken from them. Conversely, if continuous current be supplied to the commutator brushes, the loop will rotate as a continuous current motor while alternating current may be taken from the collector rings.

A simple revolving combined commutator, and collector rings as shown in Fig. 21, would suffice to convert continuous into alternating current or to rectify alternating into continuous without any field-magnet, if not for the practical difficulties arising from sparking. The use of the field-magnet is to balance the electromotive-forces in the different parts of the windings, as well as to maintain the proper rotation.

Since the two currents pass to or from the same loop,

operating in the same magnetic field there is a fixed ratio between the pressures of the alternating supply and the continuous current output, and, like-wise, between their currents. If the alternating current be single phase, the *continuous current pressure* will be $1.41 \times E$ in which $E =$ the *effective pressure* of the alternating current. If the converter be a two-phase machine the ratio is the same as that of the single phase, viz.: continuous current voltage $= 1.41 \times$ the alternating voltage. If the converter work on a three-phase system, the ratio is $1.63 \times E = V$, V being the continuous current pressure.

The Induction Motor.—The induction motor is dependent on the action of rotary magnetic fields. These sweep around the stationary part of the motor, called the stator, and cause the rotating part, called the rotor, to follow the

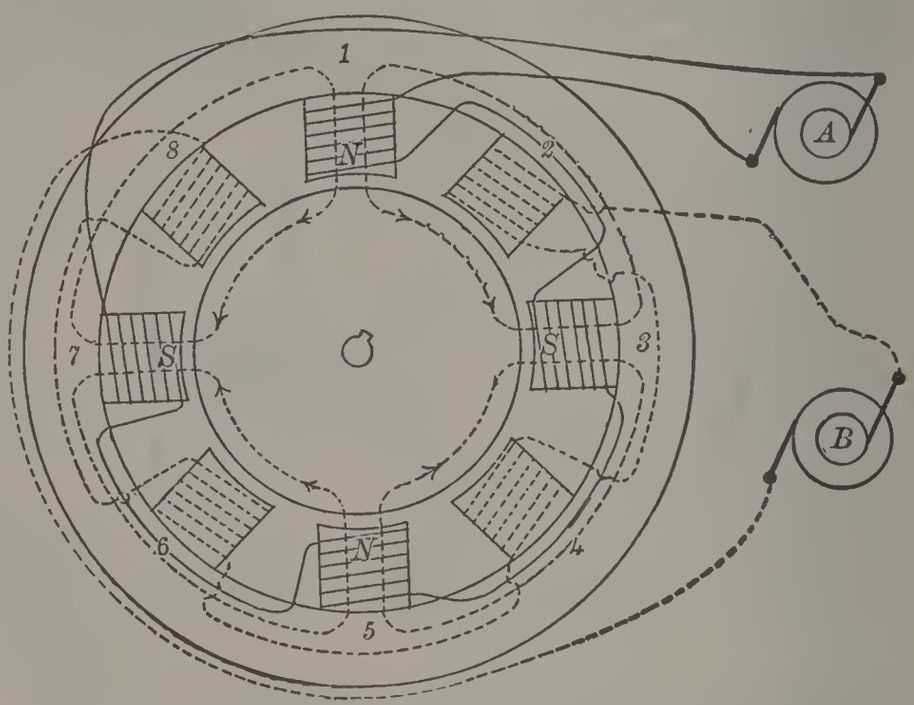


Fig. 22.

travelling magnetic flux. Rotating magnetic fields can only be produced by two or more currents which are not in phase with each other.

In the case, for instance, of a two-phase induction motor, the rotating magnetic field is produced as follows:

Consider a ring of magnetic material having 8 inwardly projecting poles as shown in Fig. 22 numbered from 1 to 8. Assume that each alternate pole is connected in circuit to one source of alternating current, while each intermediate pole is connected to another source of alternating current. Thus poles 1, 3, 5 and 7 are connected to one dynamo A, while poles 2, 4, 6 and 8 are connected to dynamo B. Dynamos A and B are mechanically connected by a shaft (not shown) so that their armatures will always preserve a fixed relation to each other. This relation is such that at the instant when the alternating, and therefore varying, current in armature A reaches its

maximum value, the value of the current from B is zero, and when B is maximum, A is zero.

The windings on the poles, magnetize the poles in a direction dependent on and changing with the direction of the current and to a strength or intensity proportional to the strength of the current. Since poles 1 and 5 are wound oppositely to poles 3 and 7 the magnetism of 1 and 5 will begin at zero, rise to a high magnetic strength as north poles, while 3 and 7 become south poles, then they will all decrease in strength to zero, then rise again to a strongly magnetized condition but with their polarities reversed; thus following exactly the rise from zero to a maximum of the alternating current in one direction, then down to zero again and to a maximum in the opposite direction, and again to zero just as has been explained in ELECTRICITY, DYNAMIC.

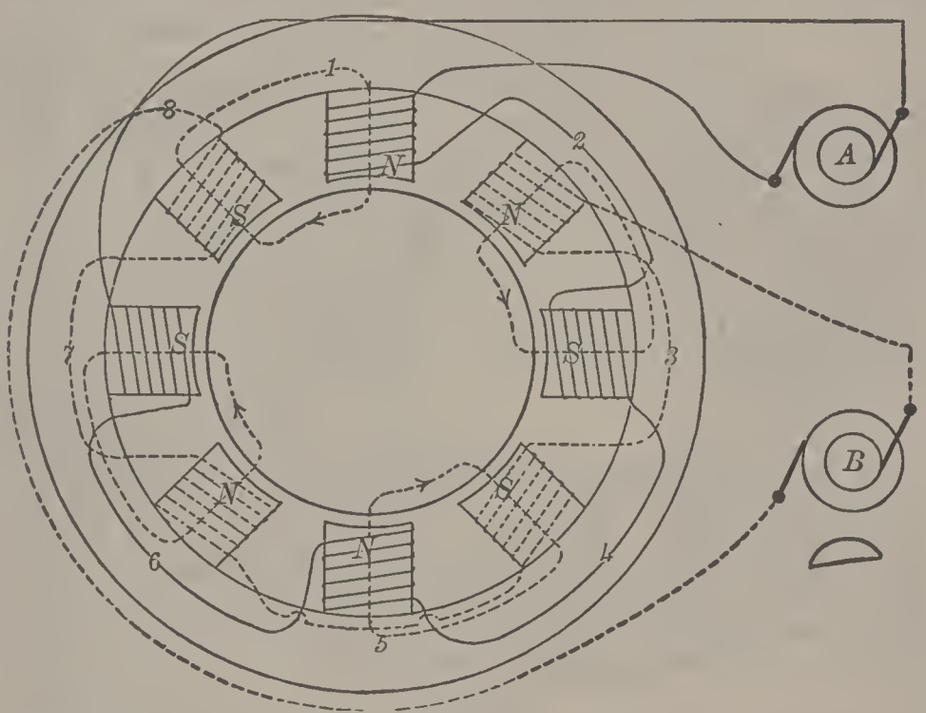


Fig. 23.

The magnetization of poles 2, 4, 6, and 8 also rises, falls, reverses and returns to zero in accordance with the current from dynamo B, in exactly the same way, but when 1, 3, 5 and 7 are strongest north and south poles, 2, 4, 6 and 8 are not magnetized at all from B this being the instant at which B's current is zero, and, when 2, 4, 6 and 8 are strongest north or south poles, A's current is zero, and there is no magnetization of poles 1, 3, 5 and 7.

Consider now the instant when 1, 3, 5 and 7 are magnetized most strongly 1 and 5 being north and 3 and 7 being south poles, 2, 4, 6, and 8 are not magnetized, there being no current from B at this instant. The magnetic lines therefore flow from 1 and 5 to 3 and 7 as indicated in Fig. 22, the dotted loops showing the paths of the lines.

An instant later the decreasing current from A begins to weaken the magnetic strength of the pole 1, 3, 5, 7, while

the current in 2, 4, 6, 8 from B begins to rise and magnetize 2 and 6 as north and 4 and 8 as south poles. The condition, after the decrease in A's current and the increase in B's has made them equal, is that of two north and two south poles *adjacent* in four points about the ring which are equally divided around its circumference as shown in Fig. (23). The lines of force now follow the paths as shown emanating from 1, 2, 5, 6 and flowing to 3, 4, 7, 8. As the current through 1, 3, 5, 7 gradually decreases to zero, while the magnetization of 2, 4, 6, 8 from B's current increases to zero, the north poles are now 2, 6, while the south poles are 4, 8 as shown in Fig. 24. Thus the north poles have *gradually* rotated from 1, 5, to 2, 6 and the south poles from 3, 7 to 4, 8.

B's current now begins to decrease while A's increases, *but in the opposite direction* to that it first flowed in, and

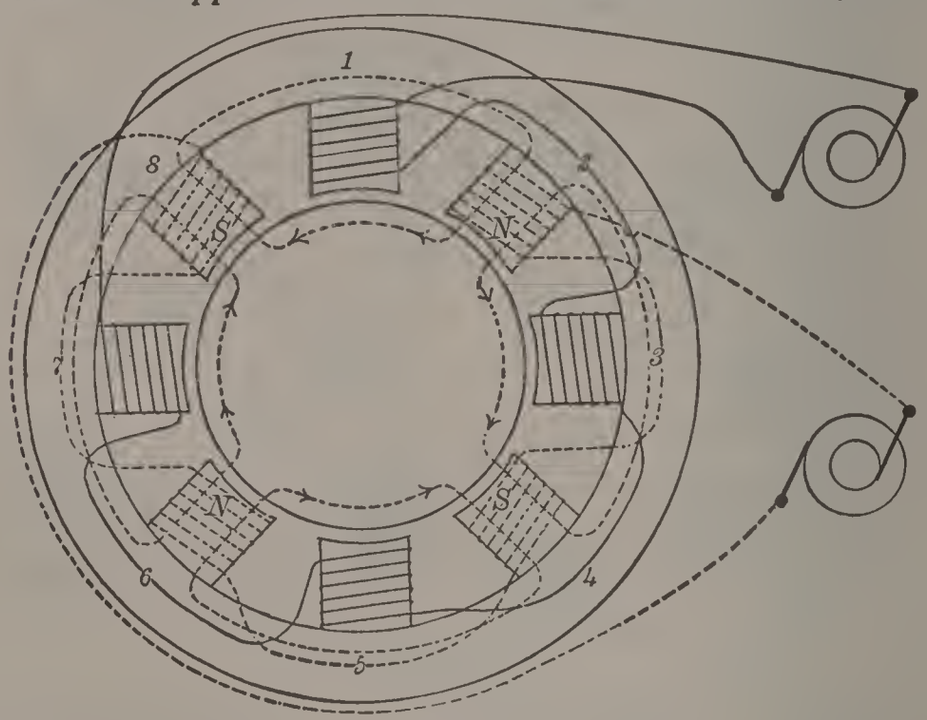


Fig. 24.

now magnetizes 1, 5 *as south and* 3, 7 *as north poles.* When the currents from A and B become equal, 2, 3, 6, 7 are north poles and 8, 1, 4, 5 are south poles. Gradually the magnetization of 2, 4, 6, 8 reduces to zero while that of 1, 3, 5, 7 rises to a maximum, 1, 5 being strong south poles while 3, 7 are north poles. It will now be seen that the north poles which first were formed at 1 and 5 have swept around to poles 2 and 6 and now to poles 3 and 7. This process is continuous and thus is the rotating magnetic field produced.

The rotor is set in the pole chamber just as is the armature of any electrical machine. The windings comprise simply a series of copper rods placed in peripheral slots around the circumference of the rotor, the body of which is made of soft iron to afford an easy path for the magnetic lines. These rods have their ends connected together by a

copper ring which fastened to each of the projecting rod ends on one side of the rotor, while a similar ring joins the ends on the opposite side. This forms a short circuited armature winding of low resistance. As the rotating field sweeps around the rotor, the moving magnetic lines cut the rotor bars and set up an electrical pressure. This causes heavy currents to flow in the rotor bars or winding owing to its low resistance and these rotor or induced currents cause the rotor to rotate in the magnetic field. The speed of the rotor when not loaded will approach that of the field. In the best motors, the rotor when loaded to its rated capacity will rotate at about 4 to 5 per cent. lower speed than that of the field. The speed of cutting lines of force by the rotor winding is equal, of course, to the difference in speed between the field and the rotor,—which difference is termed the *slip.*

This form of motor is the simplest, mechanically, of any type known, having, as it does, a few bars as a winding, no brushes, commutator, nor sliding rings.

The foregoing description is that of a two-phase motor. If the number of pairs of poles be divisible by three, as say, 6, 9 or 12 pairs—and every third pole wound for connection together each set forming a group to be supplied with current from a separate outside course, there being three such separate sources of supply instead of two, it is evident that the field will rotate just as before described. As a matter of fact, induction motors are supplied with current from two-phase or three-phase dynamos, which produce the same effect as the indicated arrangement of separate sources.

Induction motors are not now made having large poles as shown in the diagrams to illustrate the principle on which they operate, but are made with *distributed windings* as described in the section on *Alternating Current Dynamos* in this article. Consult: Boy le la Tour, *The Induction Motor;* A. S. McAllister, *Alternating Current Motors;* also the works mentioned under section *Alternating Current Dynamos.*

ELECTRICAL MEASURING INSTRUMENTS: are used to measure (a) the coulombs or quantity of electricity passing through a circuit; (b) the amperes or the rate of current flow; (c) the volts or electrical pressure; (d) the watts or electrical power expended, and (e) ohms or resistance.

All these instruments depend for their action on (1) variation in electro-static attraction between two oppositely charged bodies; (2) variation in length of a wire due to variation of its temperature with varying current flow; (3) variation in quantity of electrolytic decomposition of electrolytes, or (4) variation in electro-magnetic attraction. The last of these is by far the most used of any of the four principles set forth.

Galvanometer.—This instrument which takes many forms, is ordinarily used to measure amperes or rate of current flow. The two principal types of galvanometer are the moving magnet, and the moving coil forms.

The first type is made up of a small magnetized needle, to which a tiny mirror is attached, suspended by a long fine thread, so that it is free to turn in a horizontal plane and assume any position. Surrounding this needle is a short coil of wire, having its axis horizontal. The suspending thread passes through a small hole in the upper side of the coil like a cord passing through a bung-hole of a barrel. The magnetized needle is thus suspended in the exact centre of the coil.

If no current flows through the coil, the needle will take a position such that its ends point north and south, due to the action of the earth's magnetic field. The scale, of the galvanometer is set so that, in this postion, the needle points to zero. Movement of the scale to adjust the zero also moves the coil which is attached to the scale, so that the axis of the coil is at right angles to the zero mark.

On passage of current through the wire of the coil, a magnetic field is produced which passes through the center of the coil and is therefore at right angles to the earth's field. This field from the coil tends to make the needle set itself to it and at right angles to the earth's field. It is restrained from completely doing so, however, by the earth's field. So the needle turns from the earth's field toward the coil field by an amount which is proportional to the strength of coil field as compared with the earth's field. As a matter of fact, the two fields combine and form a *resultant* field the direction of which is fixed by their relative strengths, and in the direction of which the needle sets itself. The amount of deflection of the needle therefore from its zero position indicates to some standard, the strength of the current passing through the coil.

In order to get a long scale and read small deflections, the indicator or pointer attached to the needle must be long and one of any appreciable length would be so heavy as to make the forces acting unable to move it. Therefore it is necessary to use a beam of light which comes from a lamp, through a lens and falls on the tiny mirror attached to the needle. The light comes through a narrow slit and therefore makes a narrow luminous band on the mirror which is reflected to a long scale placed some distance from the galvanometer. The slightest motion of the needle therefore shows a perceptible movement of the band of light on the scale, and makes minute deflections easily readable.

By reason of the directions in which the two controlling forces act which direct the needle, the current flow through the coil is proportional, not to the actual angle turned through by the needle from zero, but to its *tangent*. Hence the name of *tangent galvanometer* often applied to this form of instrument.

In order to make a galvanometer very sensitive to small currents the directive force, i.e., the force with which the needle is impelled to set itself north and south, is

made small so that it is easily moved from zero. This is commonly done by making a double needle of two small magnetized pieces, usually short lengths of watch spring. These needles have nearly the same magnetic strength, and they are fastened together so that one has its north pole and the other its south pole pointing north; in other words they are placed with their poles reversed to each other. The directive force is now that due to the net magnetic strength of the combined needles which is the *difference* between the two strengths and this is exceedingly small. This combination of two needles arranged with their poles pointing in opposite directions is called an *astatic pair* or system.

Obviously galvanometers of this type are very sensitive to any external electrical disturbances such as may proceed from neighboring electric light or railway wires and cables.

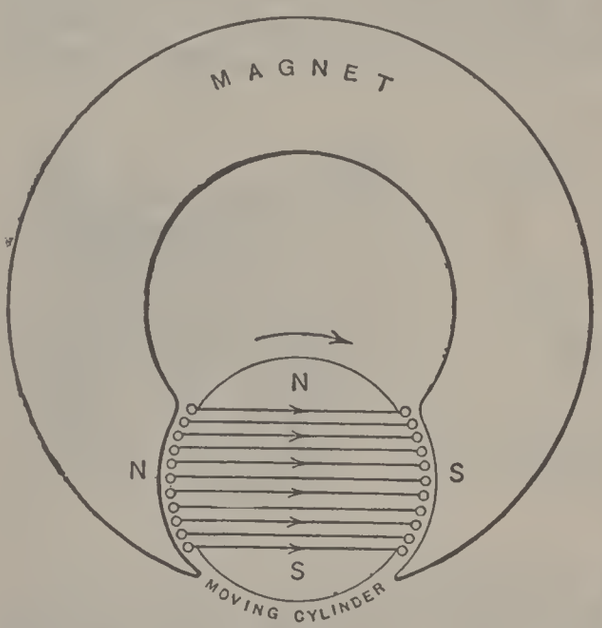


Fig. 1.

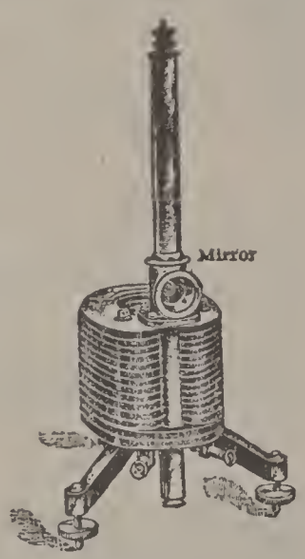


Fig. 2.

To obviate this difficulty, D'Arsonval devised the second mentioned type of galvanometer which bears his name, and this instrument is important because its principle is used in the great majority of commercial volt, ampere and watt meters. It consists of a heavy permanent magnet of considerable strength. Between its poles is suspended by a flat metal strip, a small cylinder of iron, free to turn, but controlled by the suspending strip which is twisted when the cylinder turns, and therefore exerts an elastic force to hold the cylinder in a fixed position.

A coil of wire is wound over the cylinder, down one side across the end, up the other side and across the other end, that is, the axis of the coil is at right angles to the axis of the cylinder. This arrangement is indicated in Fig. 1, which is a plan view of the magnet poles, cylinder and the coil wound over the cylinder. Flexible wires

connect to the ends of the coil. When current passes through the coil it magnetizes the cylinder so that that portion on one side of the coil is made a north pole and on the other side is made a south pole. These poles are attracted by the poles on the magnet and cause the cylinder to turn, overcoming the opposition to motion of the spring suspension, which acts as the 'directive' force. The amount of rotation of the cylinder is obviously proportional to the current passed through the coil.

A small reflecting mirror is attached to the cylinder, just above the upper end, to receive a ray of light and reflect it on the scale of the instrument, some distance away.

Fig. 2 shows a complete instrument of this type. Obviously it is not affected by accidental magnetic fields and is independent of the earth's field.

Shunts.—In the D'Arsonval galvanometers, only small currents can be passed through the moving coil, and therefore in order to measure large currents, *shunts* must be used.

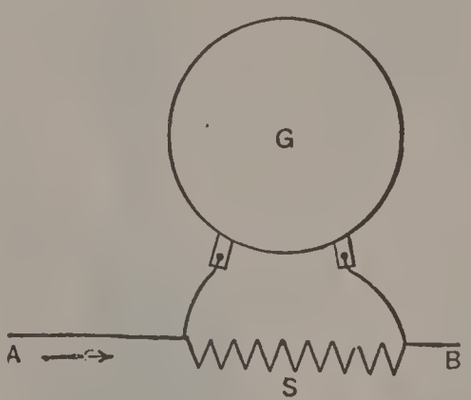


Fig. 3.

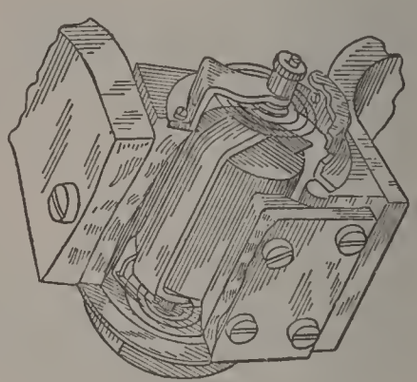


Fig. 4.

A shunt is simply a secondary path for the current to pass over and so proportioned that for any current through a circuit a definite proportion will pass through this secondary path or shunt.

As is shown elsewhere (see ELECTRO-DYNAMICS) a current passing to two parallel branches, divides in a proportion inversely proportional to the resistances of the two branches.

Thus in Fig. 3 if S is the shunt and G the galvanometer, the resistance of S being 1 ohm and that of G is 5 ohms, and 30 amperes be flowing through the circuit from A to B, five times as much will flow through S as will flow through G. That is $\frac{5}{6}$ of the total current or 25 amperes will flow through S and $\frac{1}{6}$ or 5 amperes will pass through G. Therefore, if the galvanometer registers 2 amperes, the total current in the circuit is 12 amperes. By this arrangement large currents may be measured though a small current only be passed through the galvanometer.

Indicating Instruments.—If the D'Arsonval galvanometer, before described, be graduated by comparison with some standardized current-measuring instrument, it may be

and often is used as an ampere or volt meter. Such apparatus is, however, clumsy and unnecessarily sensitive, and the use of a beam of light for taking the readings is inconvenient. In instruments of this class for the regular measurement of commericial current strengths, the suspension strips of the reflecting galvanometers are replaced by pivots working in jeweled bearings, and a needle attached to the coil is moved by it over a calibrated scale, instead of the mirror and light beam arrangement, a commercial-moving coil instrument, thus being a modification of the D'Arsonval galvanometer.

A common form of this D'Arsonval type of ammeter, built along the above lines, is the instrument, whose mechanism is shown in Fig. 4. The rotation of the active coil in this and similar meters is opposed by a pair of flat spiral springs whose inner ends are electrically connected to the coil terminals, and whose outer ends are secured to fixed abutments through which the current is led into and out of the apparatus. The springs offer an opposing force that increase in direct proportion to the angle through which they have been wound up, and, as the turning effort of the coil increases in direct proportion to the current strength, equal current increments produce equal increments of the deflection of the needle, and the scale is therefore equally divided.

In this instrument, as in the original D'Arsonval form, the tendency of the coil to oscillate about the point of equilibrium before coming to rest is obviated by winding the moving wire on a frame of metal of good electrical conductivity, such as copper or aluminum. This frame acts like a short-circuited conductor in a motor armature, and, consumes energy which is subtracted from that due to the inertia which tends to swing the needle beyond the position of equilibrium.

The strength of the currents that can be passed through the coil of an instrument of this description is very small as compared with those used in most commercial work, as the springs, which serve also as conductors, become overheated and lose their proper elasticity if a very small current flow through them be exceeded. In order to render the apparatus available for the measurement of large currents, shunts are used as in the case of reflecting galvanometers. When these instruments are used to measure the *current* they are called *ampere-meters.*

They also are used to measure the *voltage* or *electrical pressure* and when made for this purpose the coil has a large number of turns of very fine wire giving a high resistance. An auxiliary resistance is also placed in the instrument which is connected in series with the coil, that is the current passes through the resistance and then through the coil. Therefore in order to force current through the coil, the combined resistance of coil and auxiliary resistance must be overcome by the voltage to be measured. This arrangement is used simply to make the current to the instrument very low being in practice about $\frac{1}{100}$ ampere.

Of course, these meters register the *current* passing through the coil, but the current is proportional to the voltage or electro-motive force which impels it. This is clear from Ohms law: $I = \frac{E}{R}$ in which I = current, E = Voltage and R = Resistance (see ELECTRO-DYNAMICS). Therefore if the scale be graduated to read volts the instrument becomes a *voltmeter*.

Ballistic Galvanometer.—In the measurement of small quantities of current which pass through a circuit in such a short time that no real reading of its value can be obtained with any ordinary indicating instrument—such as condenser discharges—the ballistic galvanometer is used.

Either of the galvanometers previously described may serve as a ballistic galvanometer, provided the moving coils or needles have sufficient inertia to remain stationary until the total current to be measured has passed through the instrument. The energy of the transient electricity causes the moving element of the galvanometer swing, producing what is called a *throw*, of the needle or mirror. The length of this throw, that is the angle through which the moving part turns, is a measure of the quantity of electricity which has passed through the galvanometer.

In order to determine the quantity of current which will produce a given throw of the needle, it is necessary to find the logarithmic decrement, the galvanometer constant, and the period of vibration of the instrument.

The quantity of electricity discharged through the galvanometer is computed by the formula.

$$Q = C \times \left(1 + \frac{L}{2}\right) \times \frac{T}{2.\pi} \times d.$$

Q = Quantity of electricity in coulombs.
C = Galvanometer constant.
L = Logarithmic decrement.
T = Period of vibration.
d = Observed deflection.

Hot Wire Instruments.—Volt and ampere meters are made in which the movement of the indicating needle is caused by the expansion of a wire, due to its increase in temperature when current passes through it. Since the temperature change is small and the expansion consequently very minute, the actual change in length of the wire must be greatly multiplied by some mechanical arrangement in order to produce sensible movement of the needle for small currents. The general arrangement of one instrument of this type is shown in Fig. 5. Referring to it, a wire, *a b*, of high resistance, low temperature coefficient and non-oxidizable metal is secured at one end to a plate, *c*, passed around a pulley, *d*, secured to a shaft, *e*, and its free end brought back again and mechanically, though not electrically, attached to the same plate, *c*. Plate, *c*, is kept under stress by the spring, *f*, which constantly tends to pull it in a direction at right angles with the axis of the shaft, *e*. To the shaft, *e*, is likewise secured

an arm, *g*, bifurcated at one end and counterweighted at the other. Between the extremities of the bifurcated ends of the arm, *g*, is another shaft, *h*, on which there is small pulley and to which is attached the needle, *a i*, that gives the desired indications; a fine silk fiber is attached at one end to one of the arms of *g*, then passes around the pulley and the staff, *h*, and has its other extremity secured to the other arm. The arms are springy and serve to keep the silk fiber taut. The current to be measured flows through the wire *a* only, entering and leaving as indicated by the arrows. Evidently, when *a* is heated by the passage of current, it expands, which, as *a* and *b* were originally under the same tension, makes *a*'s tension relatively less than that of *b*, and equilibrium can be restored only when the pulley, *d*, rotates sufficiently again to equalize the strain. The rotation of *d*, of course, carries *g* with it, and *g*, in moving, causes the silk fiber to rotate the shaft which carries the needle. If the tem-

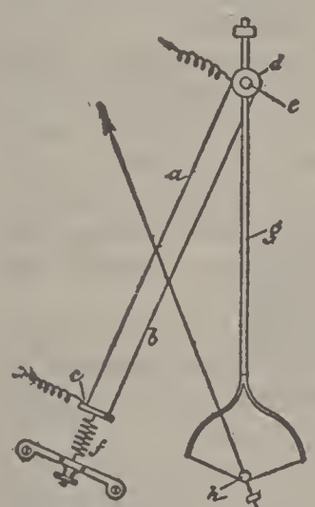


Fig. 5.

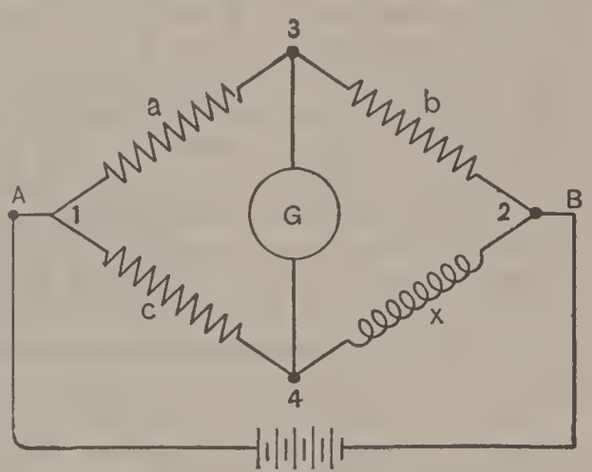


Fig. 6.

perature of the air surrounding the instrument changes, *a* and *b* are affected alike, and their resulting equal expansion simply results in a movement of the plate, *c*, back or forth in its path without any tendency to rotate the pulley *d*.

Wheatstone Bridge.—This device is used to determine resistance and takes many forms. It is essentially a series of known resistances which may be connected together in any desired combination. The theory of its application is as follows:

If current be passed through two parallel circuits, as G and S in Fig. 3, the current will divide, so that the amounts flowing in each circuit are inversely proportional to their respective resistances. Thus if S=2 ohms and G=8 ohms, four times as much current will flow through S as flows through G. The sum of the currents in S and G must be equal to the total current passing from A to B. This is easily understood by comparing the wires to pipes and the current to water flowing through them. If one

pipe be four times as large as the second, that is, offer one-fourth the resistance to the passage of the water, four times as much water will flow through it as will pass through the second, and, considering that water flows from A to B, the total amount of water flowing is the sum of the amounts carried by each pipe.

The fall in potential—or voltage drop—from point 1 to point 2 is the same measured through either branch. Thus if 5 amperes is the total current, 1 ampere will flow through G and 4 amperes through S. The drop is equal to the current multiplied by the resistance. Measured over G it is $1 \times 8 = 8$ volts, while if measured over S it is $4 \times 2 = 8$ volts.

Fig. 6 is the diagrammatic representation of the connections of a Wheatstone bridge. a, b and c are resistances of the bridge, all of known values. X is the resistance to be measured. It may be a short coil of wire or a long cable with its ends attached to points 2 and 4. G is a galvanometer connected to points 3 and 4.

The resistances a, b and c are so adjusted that when current flows from A to B through the branch circuits the galvanometer shows no deflection. Therefore, with this condition, no current flows from 3 to 4, hence the potential of 3 and 4 must be the same, that is, there is no voltage whatever between them. One portion of the current therefore flows through branch a b while the other portion flows through branch b c.

Since 3 and 4 are at the same potential the volts drop from 1 to 3 must be exactly equal to the drop from 1 to 4. The drop in any circuit is equal to the current multiplied by the resistance through which it passes.

Let k = current through the upper branch and m = current through lower branch. Then $a \times k$, which is the volts drop in the upper branch to 3, must be equal $c \times m$, which is the volts drop in the lower branch to point 4. Also, since the volts drop at 3 and 4 are equal and also equal at 2, $b \times k = X \times m$. Knowing a, b and c it is only a question of algebra to solve the equations for X.

$$ak = cm \quad (1)$$

and $$bk = Xm \quad (2)$$

dividing (1) by (2) $$\frac{ak}{bk} = \frac{cm}{Xm}$$

or $$\frac{a}{b} = \frac{c}{X}$$

whence $$X = \frac{bc}{a}$$

Voltameter.—This instrument measures the *coulombs* or *quantity of electricity* and the *amperes* or *rate of flow* is also determined, by dividing the total coulombs by the number of seconds of time during which the determination has continued. It depends for its action on electro-deposition of metals by the electric current.

If two pieces of metal be immersed in a solution of a

metallic salt and current be passed through the plates and solution, the metal in solution will deposit on the plate by which the current leaves the solution (or electrolyte). The plate by which current is received from the positive pole of the dynamo and from which current passes into the electrolyte is called the *anode* and the plate by which it leaves the solution is called the *cathode*.

In the voltameter the cathode is a plate of platinum, the anode is silver and the electrolyte is a solution of silver nitrate. Passage of current deposits silver from the electrolyte on to the platinum plate. As fast as the solution is thus depleted of its silver, more is added to it from the silver of anode which is gradually eaten away.

Since one coulomb is that quantity of electricity which passing through a voltameter will deposit 0.001118 of a gram of silver, it is a simple matter to compute the number of coulombs passed through the voltameter by weighing the cathode before and after passage of current. The difference in weight divided by 0.001118 is the number of coulombs.

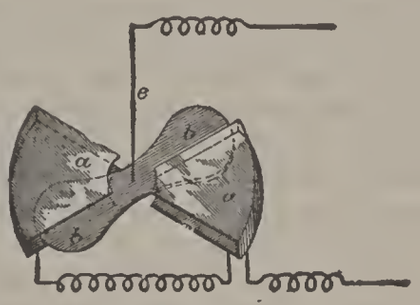


Fig. 7.

Electro-Static Instruments.—If two bodies charged to opposite potentials, be placed near each other, they will tend to approach each other, exercising a definite attracting force proportional to the area of the adjacent surfaces and the difference of potential between them (see ELECTRICITY, PRINCIPLES OF, section *Electro-Statics*). This principle is used in certain instruments for measuring the voltage (or potential difference) of an electric circuit.

Fig. 7 illustrates the arrangement of this type of instrument. *a*, *a* are two double metallic sectors, *h*, *h* a movable paddle-shaped plate, either suspended or pivoted to turn about its centre, working between the two sectors.

If a potential be applied to *b b* and an opposite potential to *a* and *a*, as shown, the plate *b b* will tend to rotate and place itself exactly in line with *a a*, being attracted by the law as previously stated. This tendency to rotate may be opposed by the elasticity of the suspension fibre or by a small spring, and, as the amount of rotation of the plate *b b* is proportional to the voltage applied, the instrument may be made to indicate the voltage of a circuit. It cannot, of course, measure current, as no current can pass through them. These instruments are

also called *electrometers*. They are suitable only for measuring high voltages. Their sensitiveness may be increased by putting a number of moving vanes on the same axis, each working between two fixed vanes. Such an instrument is called a *multicellular electrometer*.

Alternating Current Instruments.—Of the instruments previously described, only the hot wire and electro-static are suitable for measuring alternating currents and voltages. Obviously, any device which depends for its directive action on a permanent field either from a magnet or the earth cannot be used for alternating current determinations. In the case of the hot wire instruments, the heating is independent of the direction of the current, and depends solely on its magnitude, while in the electrostatic type, the change in the direction of the current produces simultaneous changes in the quantity of the charges on the plates and therefore the charged surfaces tend always to approach each other.

The *electro-dynamometer* principle is also used for alternating current instruments. This consists of two coils, one stationary and one movable, the latter having the pointer attached to it. On passage of current through the coils, the movable one tends to take a position in the same plane as the fixed coil. This tendency is opposed by a spring and the amount of rotation of the movable coil is proportional to the current passing through the instrument. Obviously these devices may be used either for alternating or direct current and to register volts or amperes.

Wattmeters.—These instruments indicate the *power* passing through any circuit, that is, the product of the volts and amperes or, the watts. The principle of the electro-dynamometer is that usually employed. If the current pass through one coil and the pressure of the circuit be impressed on the other coil, the current through the latter will be proportional to the pressure. The force to rotate the moving coil is proportional to the currents in the two coils. Hence the rotative force is proportional to the volts and amperes of the circuit and the scale is graduated to read the watts or power of the circuit.

In the case of alternating circuits supplying current to inductive devices, so that the voltage and current changes do not occur simultaneously, *i.e.*, when a power factor must be taken into account, these instruments indicate the true power and no corrective factor is necessary.

Ground Detectors.—Any type of electrical measuring instrument may be used as a ground detector, *i.e.*, for discovering if any of the outside insulated wires have become connected to the ground, so that the fault may be located and corrected.

If an electrical instrument have one of its terminals connected to the ground and the other terminal arranged to connect, by a switch with either side or wire of a circuit, a ground will be indicated. For instance, if the positive

wire be grounded, and the instrument terminal be connected to the negative wire, current will flow through the positive wire to ground and to the grounded side of the instrument; through it to the negative wire. This will, of course, cause a deflection of the instrument needle. Conversely a deflection of the needle when one terminal is connected to the positive wire, shows a ground on the negative wire. Incandescent lamps may also be used.

Integrating Instruments.—This class of instruments is to give a record of the ampere hours, or the watt hours of electricity that have been passed through a circuit.

In nearly every case, they comprise a registering apparatus, similar to that of a gas-meter, driven by a small electric motor. This motor has an armature of high resistance and, in series with it, is placed a high resistance fixed in position, so that the total resistance of the armature circuit is very great. The motor speed is low and the field comparatively weak, so that the counter E. M. F. of the armature is very low, and in fact negligible as compared with the resistance of the armature circuit. Under these conditions, the speed of the motor will increase or decrease, with increase or decrease of voltage applied or of field strength. In the case of the watt-meter, the armature is connected across the circuit, receiving the voltage of the line, and the current is passed through the field windings. The speed of the motor therefore changes with the change either of potential or current, and its speed being thus always proportional to the watts of the circuit, the registering apparatus will record the watt hours, that is, the product of watts and the length of time they passed through the circuit.

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ELECTRICAL POWER, Transmission of. See Power, Electrical, Transmission of.

ELECTRICAL PROTECTIVE DEVICES: protective devices are used for (1) prevention of excessive current flow, due to faults or short circuits, (2) the prevention of excessive pressures, (3) the prevention of lightning, or high pressure static discharges from passing to apparatus, and injuring it, and (4) the prevention of external currents under high pressure from entering on low potential wires such as telephone and telegraph circuits.

The two forms of devices in common use to protect a circuit against excessive current flow are, circuit breakers and fuses.

The circuit breaker is simply an electric switch which is provided with a strong spring that tends always to throw the switch open. Normally, the switch is kept closed by a small latch which locks it in position. The latch is held in place by a small weight or spring. A magnetizing coil or winding, which is connected so that the current to the line passes through it, magnetizes an iron core

attached to the latch, the magnetic pull tending to lift up the weight, open the latch and release the switch so that the spring will throw it open. When the current is within its proper limit, the force exerted by the weight is greater than the magnetic pull and the latch remains in its normal position. When the current strength exceeds its proper amount the magnetic pull is increased, overcoming the force exerted by the weight, and opening the latch. The spring instantly throws open the switch, thereby cutting off current flow.

Fuses.—Fuses are short lengths of some metal or alloy which melts at a low temperature and which are inserted in electric circuits to prevent excessive current flow. They are generally made of zinc or an alloy of tin and lead. They appear in the form of wires or flat metallic strips, having a certain cross sectional area, the size of the fuse depending on the maximum current it is to carry. If the current flow through the circuit should exceed this maximum, the increased amount of heat produced by the passage of the current through the fuse wire, will raise its temperature to such a point that it melts and thereby opens the circuit.

Fuses are usually placed on porcelain blocks having covers, or enclosed in tubes with sand packed around them, so that in melting, no conflagration can result no matter where the fuse may be located. In all cases, the porcelain block or other receptacle is arranged so that melted fuses may be quickly and easily replaced.

Lightning Arresters.—When an external, overhead circuit is struck by lightning, or when lightning discharges produce sudden, transitory pressures of great magnitude, the overhead line may become suddenly charged at a potential differing greatly from that of the earth. A sudden rush of electricity tends to take place between the line and the earth, and in this effort to discharge to earth, current impelled by these excessive pressures, rushes over the line to power stations, into the apparatus connected with it, and leap through the apparatus to the ground, puncturing and burning the insulation and thus ruining the machines.

Lightning arresters to prevent this, are simply pieces of metal or carbon insulated from each other and placed close together so that only a small air gap separates them. One of the pieces is connected to the circuit to be protected, the other is connected to the ground. When a sudden, high potential discharge of the line takes place, the electricity jumps across the air space between the two pieces to the ground. The inductance of the coils of wire in all electrical devices sets up a counter pressure opposing the sudden current inrush, and this effect assists in impelling the discharge current to leap across the air gap to the earth.

The distance of separation of the two pieces connected to the line and to earth is such that the normal pressure of the line cannot carry the current across it.

External currents of high potential are prevented from flowing in telephone circuits by means of *thermal arresters* which act to connect the circuit to ground, and thus put the line at the same potential as the earth, thereby preventing users of 'crossed' circuits from receiving dangerous shocks. If for instance, a high potential line should come in contact with a telephone circuit a current will tend to flow to the ground. The thermal arrester has a fine coil of high resistance wire enclosed in a hard rubber tube. The current flow through this resistance will generate heat and the temperature will increase until a spring is released by the melting of a special solder of an alloy which fuses at a low temperature. The releasing of this spring closes a circuit directly to the ground, thus putting the telephone circuit at the ground potential and obviating the possibility of any danger to the user of a telephone.

ELECTRIC ARC. See ARC, ELECTRIC.

ELECTRIC BATTERY. See BATTERY, ELECTRIC.

ELECTRIC BELL. See ELECTRICAL COMMUNICATION, SYSTEMS OF.

ELECTRIC CHARGE. See CHARGE, ELECTRIC, and ELECTRICITY, PRINCIPLES OF.

ELECTRIC CIRCUIT. See CIRCUIT, ELECTRIC, and ELECTRICITY, PRINCIPLES OF.

ELECTRIC CURRENT. See ELECTRICITY, PRINCIPLES OF.

ELECTRIC DENSITY. See DENSITY, ELECTRIC, and ELECTRICITY, PRINCIPLES OF.

ELECTRIC FISH: fish having the power of giving an electric shock. Electric organs are found in a few fishes; peculiar structures arising from a modification of muscular tissue, and capable under nervous control of a genuine electric discharge. The degrees of development vary greatly. The organs are powerful in the Electric Eel (Gymnotus), in the African Cat-fish (Malapterurus), and in the Electric Ray (Torpedo), in order of degree. They are weakly developed, or 'pseudo-electric,' as they used to be called, in all the Rays except Torpedo, and in several species of bony fishes (Mormyrus and Gymnarchus.) Prof. Cossar Ewart has demonstrated a very rudimentary electric organ in the common skate. To receive the shock the object must complete the circuit by a double contact with the fish, either directly or through some intervening substance. When well developed, the organ may be useful to the fish in two ways—in paralyzing or killing fishes used as food, and in warding off attacks of enemies.

The electric ray and eel were known to the ancients, and were used for curative purposes, 'the earliest electric machines employed by mankind.'

The origin of the organs, useless when incipient, and the connection between this peculiar development and

the ordinary electrical properties of muscle and nerve, are unsolved problems.—See GYMNOTUS: MUSCLE: NERVE: RAY: TORPEDO: Batuchin in the *Arch. f. Anat. und Physiol.* (1876), for recent researches; Coldstream, article 'Animal Electricity' in Todd's *Cyclo.* of *Anat. and Physiol.* (1836-39), for old observations and stories; C. Gegenbaur, *Comparative Anatomy* (trans. by F. Jeffrey Bell, 1878); Günther, *Introduction to the Study of Fishes* (1880); Du Bois Reymond, *Gesammelte Abhandl, z. allg. Muskel-und Nerven-physik*, bd. ii.; R. Wiedersheim, *Comparative Anatomy* (trans. by W. Newton Parker, 1886).

ELECTRIC FURNACE: the high temperatures which are obtainable by the use of the electric current, have been applied to furnace work of various kinds, and since the development of this application of electricity, new substances have been produced and are now offered on the market as staple commodities. Carborundum and calcium carbide are examples.

There are two classes of electric furnaces: one employs the arc, the other obtains its heat from the passage of current through resistance.

The arc furnace comprises simply a large carbon rod to which one pole of the dynamo is attached. The other pole is attached to either the substance in the furnace to be reduced, or to another carbon.

When the arc is formed, the intense heat involved raises the temperature of the furnace to the desired point, the maximum available being about 5,500 deg. F.

The resistance furnace usually employs two carbons, and between and in contact with them is the material to be smelted, which must be a conductor of considerable resistance. The passage of current through the material evolves heat which soon brings up the furnace temperature to that required. The temperature is regulated by varying the current strength.

There is another form of resistance furnace, used for heating substances which have no electrical conductivity. It has a compartment or box made of refractory material, the walls being very thin. Surrounding this box is another larger box, also of refractory material, but with thick walls. There is a space of about ½ inch between the walls of the two boxes on two sides and on top the bottom of the larger box. The spaces between the two boxes are filled with a refractory substance, having a high electrical resistance. Current passes through this substance from the bottom up one side, heating the substance in its passage. As the heat is all enclosed by the thick walls of the outer box, which conduct heat but little, it cannot radiate outwards, but it passes easily through the thin walls of the inner box, heating whatever may be placed in it.

The inner box is called the *muffle*. High temperatures are attainable in the muffle and this is, in many respects, an excellent furnace, its only drawback being the frequent cracking of the thin walls of the muffle.

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ELECTRIC INSULATION. See INSULATION, ELECTRIC.

ELECTRICITY: the name given to an invisible form of energy which may be produced, and its effects observed in a number of ways. Like the wind, although invisible, it gives many evidences of its presence whenever it is produced. The name 'Electricity' was first given to this agent and to its phenomena by Gilbert, physician to Queen Elizabeth, being derived from the Greek word 'elektron' which means 'amber'—this substance being the first in which electrification was observed.

The observable phenomena by which electricity manifests itself are: (1) the production of heat; (2) the attraction of bodies of various kinds; (3) the decomposition of water into its constituent gases; (4) by physiological effects in the nature of a nervous shock.

The general belief now is that electricity, magnetism, heat and light all proceed from the luminiferous ether. Different kinds of motions imparted to the ether produce different phenomena, depending for their character on the rapidity of vibration, the length and amplitude of the ether waves set in motion; and the four phenomena which are known and attributed to ether disturbances are light, heat, magnetism, and electricity.

Historical Sketch.—Thales, about B.C. 600, refers to the fact that amber when rubbed attracts light and dry bodies. This was the only electric fact known to the ancients. The science of Electricity dates properly from A.D. 1600, when Gilbert of Colchester, England, published a book, *De Arte Magnetica,* in which he gives a list of substances which he found to possess the same property as amber, and speculates on magnetic and electric forces. He is the inventor of the word electricity. Otto von Guericke, Burgomaster of Magdeburg, in his work *Experimenta Nova Magdeburgica* (1672), describes, among his inventions, the first electric machine ever made, which consisted of a globe of sulphur turned by a handle, and rubbed by a cloth pressed against it by the hand. Hawksbee (1709) constructed a machine in which a glass cylinder, rubbed by the dry hand, replaced Guericke's sulphur globe. Grey and Wehler (1729) were the first to transmit electricity from one point to another, and to distinguish bodies into conductors and non-conductors. Dufay showed (1733–45) the identity of electrics and non-conductors, and of non-electrics and conductors, and was the first to discover the two kinds of electricity, and the fundamental principle which regulates their action. Between 1733 and 1744 much attention was given in Germany to the construction of electric machines. Till this time, notwithstanding the inventions of Guericke and Hawksbee, the glass tube rubbed by a piece of cloth, which Gilbert

first introduced, was used in all experiments. Boze, professor at Wittenberg, taking the hint from Hawksbee's machine, employed a globe of glass for his machine, and furnished it with a prime conductor. Winkler, professor at Leipsic, was the first to use a fixed cushion in the machine. The Leyden jar was (1746) discovered accidently at Leyden by Muschenbroeck; but the honor of the discovery has been contested in favor of Cuneus, a rich burgess of that town, and of Kleist, canon of the cathedral of Camin, Pomerania. Franklin (1747) showed the electric conditions of the Leyden jar and (1752) proved the identity of lightning and electricity by his famous kite experiment. This last was performed with the same object about the same time, and quite independently, by Romas of the town of Nerac, France. In 1760, Franklin made the first lightning-conductor. Canton, Wilke, and Aepinus (1753–59), examined the nature of induction. Ramsden (1768) was the first to construct a plate-machine, and Nairn (1780) a two-fluid cylinder machine. The electrophorous was invented by Volta, 1775; and the condenser by the same electrician, 1782. In 1786 Galvani made the discovery which led to the addition of the new branch of the science which bears his name, and which now far exceeds the older branch in extent and practical value. In 1787, Coulomb, by means of his torsion-balance, investigated the laws of electric attraction and repulsion. In 1837 Faraday published the first of his researches on induction, and Armstrong, in 1840, designed his hydro-electric machine.

ELECTRICITY, Atmospheric: the existence of electrical charges in the atmospheric moisture and in clouds between which there is a potential difference causing discharges to pass through the air.

The origin of cloud charges is the addition of innumerable small charges, which latter collect on the minute particles of moisture of which the cloud is composed. When these charged particles collect into larger particles —or large drops—the charges, and consequently the potentials, are enormously increased by reason of the increase in quantity of electricity stored in a molecule having a far smaller surface. See Condenser.

ELECTRICITY, Dynamic: a term used to denote continuously flowing electricity, or current electricity capable of doing work.

ELECTRICITY, Galvanic: old term for continuous current electricity or the kind of electricity given out by an electric cell.

ELECTRICITY, Frictional: electricity produced by friction. Static electricity.

ELECTRICITY, Faradic: old designation of altering or pulsating electric currents used therapeutically.

ELECTRICITY, Principles of: electricity and magnetism (q.v.) are so interconnected and mutually depend-

ent that it is considered advisable here to treat them both together under the above caption, rather than make an attempt to separate them.

The science of electricity is separated into Electro-static, Electro-magnetic and Electro-dynamic (or electro-kinetic) divisions according to the phenomena of manifestations which are produced.

Electro-statics.—The earliest observations and investigations were made in the branch of Electric-statics, or the science of electric charges, on bodies produced in every case by friction between two substances of different character.

If a glass rod be rubbed with a piece of silk, the rod will attract light bodies—such as pith, etc.; and if bodies touch the rod, they immediately after are repelled by it. From this it is evident that the rubbing given the rod produces an electrical charge, and this charge acts to attract an unelectrified body.

Fig. 1—Gold-leaf Electroscope.

If the weight of the attracted body is not too great to prevent the force with which the charge acts from moving it, it will travel to the glass rod and make contact with the latter. The body now receives from the rod a charge of the same character as that of the rod, and since repulsion takes place between similarly charged bodies, the pith or paper will now move away from the rod.

An instrument, called the *electroscope*, for showing whether or not a charge exists in a body, depends for its action on the law of repulsion of similarly charged bodies. This instrument, in its most elementary form, consists of two gold leaves hung side by side within a glass vessel from a metal wire attached to a metal plate or ball on the exterior of the vessel, as shown in Fig. 1. If the metal knob of the instrument be touched with a rubbed glass rod, the electricity of the glass rod reaches the gold leaves, causing them to diverge, as shown in the figure. It may further be observed that the more strongly the rod is electrified the greater is the divergence of the leaves. If a glass rod be rubbed with a piece of

leather, and the knob of the gold-leaf electroscope touched by it, the leaves diverge; on rubbing the glass rod still more, and touching the knob of the electroscope, the divergence of the leaves will be increased; but if, instead of again using the glass, we touch the knob with a rubbed rod of sealing-wax, the leaves collapse. If the order be reversed, touching the knob with the rubbed sealing-wax first, the leaves diverge, and then collapse when the knob is touched by the rubbed glass rod. This experiment shows that, although both the glass and the sealing-wax rods become electrified by rubbing, the electrical conditions of the two bodies are opposite in character. When one makes the gold leaves diverge, the other makes them collapse. If instead of the gold-leaf electroscope, two pith-balls be used, we find that after they have been touched with the rubbed glass they repel one another and are also repelled on the approach of the rubbed glass. But if now the rubbed sealing-wax is brought near they are violently attracted by it. We distinguish, therefore, between two kinds of electrification; viz., that of the rubbed sealing-wax, which has been termed resinous, and that of the rubbed glass, which has been termed vitreous.

Further experiments show, however, that the nature of the electrification of bodies depends not only upon the bodies rubbed, but also upon the substance used as the rubber. Therefore the electrical condition of a body is not sufficiently indicated by either of the above terms, and it has been agreed that the one kind of electrification should be termed *positive* and the other *negative*; the condition of glass rubbed with leather represents the former, resin rubbed with wool the latter. Therefore positively electrified bodies are all those bodies that exhibit the same properties as a glass rod rubbed with leather, and negatively electrified bodies all those which exhibit properties of the opposite kind. The phenomena observed concisely stated, come to this: (1) There are two kinds of electrification, positive and negative; (2) Bodies exhibiting the same kind of electrification repel each other, while bodies charged with opposite electrifications attract each other.

Later on, experiments will be adduced to prove that the two kinds of electrification are produced simultaneously in equal quantities, and that the positive electrification of the rubbed body is matched, at the moment of generation, by an equal negative electrification of the rubber. Also that when equal quantities of positive and negative electrification are communicated to a body they neutralize one another, and the body does not change its electrical condition.

Electrics was the name given by Gilbert to those bodies which he was able to electrify by friction. In order, then, to ascertain whether a body can be electrified or not, it is not sufficient merely to take that body in the hand and rub it; it should be carefully insulated first. When such precautions are taken all bodies, without

exception, can be electrified. The following experiments show that in the process the rubber also becomes electrified. In Fig. 2, A is a glass disc, B a disc covered with

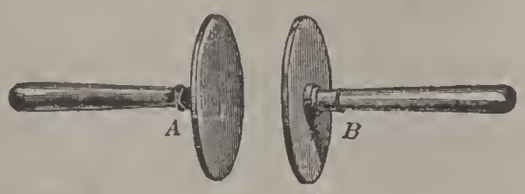


Fig. 2.—Insulated Discs.

amalgamated leather; both being insulated by means of glass handles. If these two plates are rubbed together, each of them becomes electrified, the glass plate positively and the leather negatively. If for the glass, resin be substituted and B be covered with wool instead of leather, and the two be then rubbed together, the resin plate becomes negatively electrified and the wool plate positively. From these and similar experiments we learn that: (1) All bodies may be electrified by rubbing; (2) Both bodies are electrified when rubbed, one of them positively and the other negatively; (3) The same substance may be either positively or negatively electrified by using different substances as rubbers.

The following list is so arranged that any substance in it becomes positively electrified when rubbed by any of the substances taking rank after it:

+Catskin or fur	The hand	Ebonite
Wool	Wood	Resins
Glass	Sulphur	Guttapercha
Ivory	Flannel	Metals
Silk	Cotton	
Rock crystal	Shellac	

Comparison of Charges of Electricity.—It has been mentioned that the only evidence of a body's being charged with electricity is afforded by the force it exerts on other bodies. It is plain, therefore, that we must measure quantities of electricity by the relative forces which these quantities exert under similar conditions, and in order to do this we must ascertain the connection between the quantities of electricity and the forces they exert. To ascertain, accurately, the connection between the force exerted between two electrified bodies, Coulomb employed his torsion balance, a form of which, arranged for electrical experiments, is shown in Fig. 3. The instrument comprises two light balls balanced at the extremities of a glass or shellac rod, as shown at B, and a similar ball attached to the end of a glass or shellac rod inserted at E. By means of an arrangement of this kind Coulomb measured the strength of repulsion between the balls and proved the fundamental law of electricity, namely, that 'two small electrified bodies attract or repel each other with forces proportional to the amounts of their electrification, and inversely proportional to the square of the distance between them.'

If Q_1, Q_2 be the quantities, d the distance, and f the force, then $f = \frac{Q_1 Q_2}{d^2}$.

The above equation, however, does not express the whole of the facts. The medium across or through which the action takes place, and which was called by Faraday the 'dielectric,' has an important influence on the result, and therefore some term should be introduced recognizing this influence of the medium. The more complete equation will therefore be $\frac{Q_1 Q_2}{kd^2}$ where k represents the 'specific inductive capacity,' as it is called, of the medium

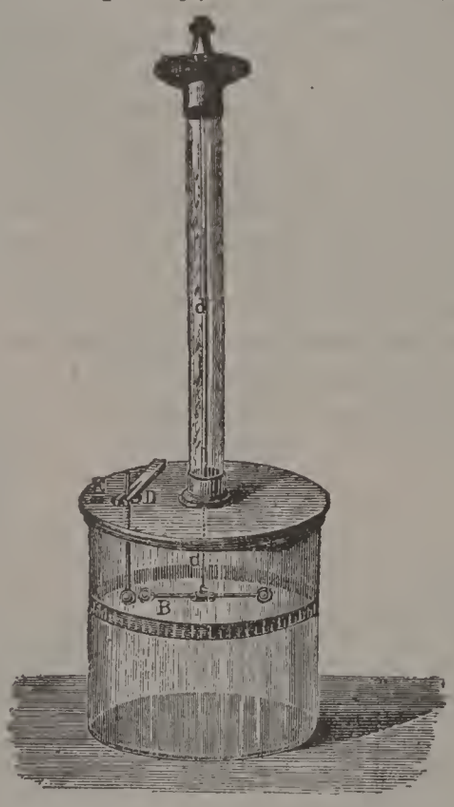


Fig. 3.—Coulomb's Torsion Balance.

or dielectric. Coulomb's law should therefore be: 'Two electrified bodies attract or repel each other with forces proportional to the amounts of their electrification and inversely proportional to the square of the distance between them and the specific inductive capacity of the dielectric which separates them.'

Unit Quantity of Electricity.—To measure quantities of electricity absolutely, it is necessary to have some unit, and the definition of this unit is furnished from the above mentioned law by making the two quantities Q_1, and Q_2 equal, and the force, the distance, and the specific inductive capacity each unity. The unit, thus defined in terms of the fundamental units now universally adopted in scientific work, is the quantity of electricity concentrated at a point which is capable of repelling a similar quantity

of electricity at another point at the distance of one centimetre in air with a force of one dyne; that is to say, with a force which would give a mass of one gram a velocity of one centimetre per second in one second. This is equal to $\frac{1}{981}$ grams or $\frac{1}{445000}$ lb.

To Faraday again must be ascribed the honor of first suggesting that the actions taking place in the dielectric medium should be represented both as to magnitude and direction by 'lines of force.' Such actions exist within the space to which the influence of any charged or electrified body or system of bodies extend, and this space is known as the 'electric field.'

The existence of this electric field is due to electric strains set up in the medium, or dielectric, as Faraday called it, during the process of electrification of the bodies. The strains consist of a tension along the lines of force and a pressure at right angles to them.

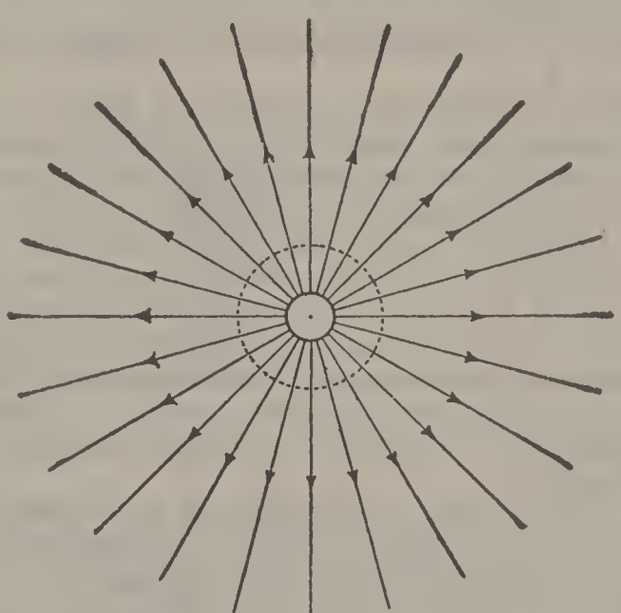


Fig. 4.—Lines of Force of a Charged Sphere.

The intensity of the field at any point is defined as the electric force with which the field would act upon a unit charge of electricity placed at the point (it being understood that the presence of this charge is not to disturb the existing field). If, therefore, a body electrified with (Q_2) units be brought to a point of the field where the intensity is 1, the actual force (f) is $f = Q_2 \times 1$.

Comparing this with Coulomb's equation, $f = \frac{Q_1 Q_2}{kd^2}$,

whence, $Q_2 \times 1 = \frac{Q_1 Q_2}{kd^2}$ and therefore $1 = \frac{Q_1}{kd^2}$, which gives the intensity of the field due to a single charge Q_1 in a dielectric of specific inductive capacity k and at a distance d from the charge.

The field set up by such a charge, supposed distributed over a small sphere, would be as represented in Fig. 4. All the lines start from the surface of the sphere, and proceed outwards in radial directions. The actual number to be drawn according to the rules can be readily determined by supposing a sphere of unit radius (1 centimetre) to surround the charged sphere as shown by the dotted circle. The intensity of the field I_1 at all points of this surface is $I_1=\frac{Q_1}{k}$ since $d=1$ and the lines must be drawn so that this number $\frac{Q_1}{k}$ crosses each square centimetre of the sphere. But the area of the surface of any sphere is $4\pi r^2$, and since $r=1$ in this case the area of the surface of the sphere in square centimetres is 4π and therefore the total number of lines required is $N=4\pi I_1=\frac{4\pi Q_1}{k}$. This number N, it must be remembered, is the total number of lines to be drawn outward from the small sphere, and not merely the number in the plane of the paper as represented in the figure. The small sphere is supposed to be positively charged, hence the arrows denoting the direction of the lines are directed outward, for the rule is that the direction of a line of force is that in which a *positively* charged body would tend to move along it. In the case represented, the positively charged body would be repelled by the positively charged sphere, hence the lines are directed outward. Conversely, had the sphere been negatively charged the lines would have run toward it.

The distribution on the surface of the sphere being uniform it is comparatively easy to draw the lines of force in the space immediately surrounding it. In other cases where the distribution is less uniform, the problem becomes more complicated. But when we consider how the lines of force must tend to run, we see why it is that the density of the electrification is greatest where the curvature is sharpest, the reason being that the lines of force must leave the surface of a conductor at right angles to it.

It can be shown experimentally that the presence of an electrified body is sufficient to produce signs of electrification in a neighboring conductor, although there is no conductor between them to bring them into electrical contact.

To examine the effect of placing an insulator in the electric field of a charged body take a rod or cylinder of some substance which is an insulator—for instance, a shellac rod, and place one of its ends near a brass ball. If the ball is positively electrified, the shellac rod on the near end (that is, the end nearest the ball) will be found to be negatively electrified. The difference between

good conductors and good insulators is, however, very marked. Conducting bodies when brought near an electrified body are at once influenced, but return to their ordinary state at once on the removal of the charged body; with non-conducting bodies both processes take a considerable time and the effects are less.

The investigation enables us to draw approximately, with the assistance of the previous rules, the lines of force for the charged sphere and a cylinder of conducting material under induction near it. The result will be as shown in Fig. 5, in which the lines in a central vertical plane only are drawn. The negative electrification on the end, *a*, of the cylinder, indicates that a certain number of lines end there, whilst the positive electrification on the *b* end similarly indicates that an equal number of lines set out from that end. It might be supposed that all the lines that enter at *a*, pass through the material of the cylinder and emerge at *b*. But this is not so. It is one of the fundamental properties of a conductor that it yields instantly to the smallest electric force, and that

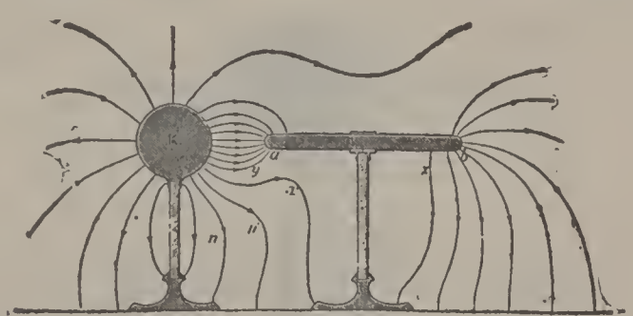


Fig. 5.—Lines of Force of Conductor under Induction.

no electric force can be permanently maintained within the substance of a conductor in which no current is passing. There can, therefore, be no electrostatic strain and no lines of force within the material of a conductor when the electric field has become steady. Hence the lines starting from *b* are entirely distinct from those ending at *a*. The two sets are equal in number because no charge has been given to the cylinder, either positive or negative and therefore the sum of all the positive electrification (or the lines starting from *b*) must be equal to the sum of all the negative electrifications (or the lines ending at *a*). In all, nine lines have been drawn at each end of the cylinder, leaving 13 lines emanating from the sphere which do not run on to the cylinder.

If now the charged ball K be withdrawn to a distance from the cylinder it will be found to show no signs of electrification, whilst K will be restored to its original condition, which will be something like what is shown in Fig. 6, where the twenty-two lines emanating from K in Fig. 5 are found to be still attached to K, but their negative ends are now on the table and the distant walls, etc., of the room; all these ends, therefore, cannot be shown

in the figure. Because of the greater proximity of the table, the greater number of lines are drawn from the lower surface of the sphere, where the surface density will be found to be greater than on the upper surface.

Electrification.—We must now consider more closely the method of producing electrification by the process of rubbing dissimilar bodies together and then separating them. To get rid of any complication which might arise if the rubber were held in the hand, we take the case of Fig. 7, where the glass disc A and the leather-covered disc B are mounted on and held by insulating handles. If the disc A and B be rubbed together, but not separated, no signs of electrification can be detected by the most sensitive tests that can be applied. But if the disc be drawn apart a little distance the space between them is found to be an electric field, and as they separate farther and farther electric forces will be found to exist in more and more of the surrounding space.

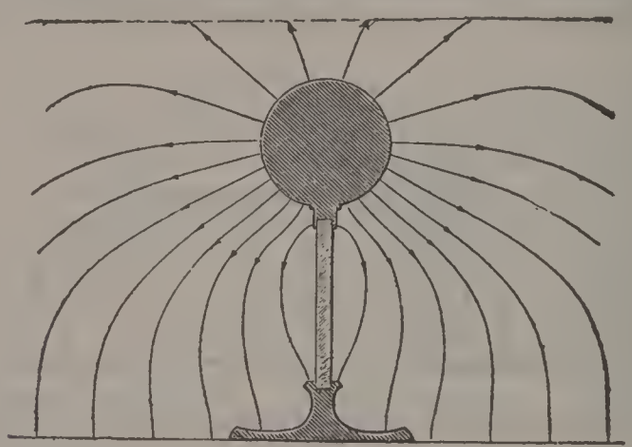


Fig. 6.

The following points are here observed:

1. As the discs are being separated they are attracting one another, and therefore work has to be done in drawing them apart. The energy thus used is stored as strain energy in the dielectric. The medium is strained and energy is required to produce this state. We now see where this energy comes from—namely, from the work done by the agent who drags the rubbed body (A) and the rubber (B) asunder. To separate the positive and negative electrifications, work must be done and the equivalent energy is stored in the medium. This energy is therefore sometimes called the energy of electrical separation. Note carefully that it is not the work, done in rubbing (which merely produces frictional heat), but the work done in separating which determines the electrical energy stored.

2. The stress indicated by the lines consists of a tension or pull in the direction of their length and a pressure or thrust at right angles to that direction. Hence the lines always tend to contract and to repel one another sideways. By bearing this in mind it is possible to indicate

the approximate direction of the lines in many cases. Thus in Fig. 7 the lines at the edges of the discs tend to bulge outward. For clearness a section of the discs has been drawn in the upper part of the figure showing the lines in the plane of the paper only.

3. The lines begin and end at the electrification or charges of electricity. In one way of looking at the phenomena, these charges may be regarded as simply indicating the places where the electrical stresses cease to exist. As far as we know these charges must always be associated with gross matter, that is, the lines of force cannot begin or end on nothing. We see that this follows at once if the lines have to be generated by some such methods as that set forth above.

4. With each line is associated a definite quantity of + electrification at one end and an equal quantity of — electrification at the other. Therefore the quantities of + and — electrification must be equal and one cannot exist without the other.

So far it has been assumed that there are no conductors

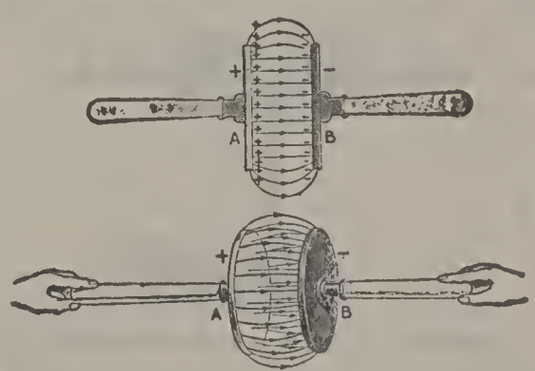


Fig. 7.—Strain Lines between Rubbed and Separated Discs.

in the neighborhood of the discs, and in this case all the lines starting from A will end on B. But in the actual case conductors, some of them very large ones, are in the immediate neighborhood of the separating discs; for instance, the body of the experimenter who is drawing the discs apart is such a conductor, or if they are drawn apart by mechanical means the great conducting mass of the earth is not far distant.

Electricity on Conductors.—From the preceding it will be obvious that, on conductors, the electrification, or electricity, that is, the ends of the lines of force, when at rest can reside only on the surface, for no line of electric force can penetrate a conductor. This, which is so obvious when we consider the dielectric, is not so clear when the old fluid theories are followed. It is an important point, however, and worthy of experimental examination. For this purpose the apparatus shown in Fig. 8 may be used. The brass ball A rests on a glass rod, and can be accurately covered by the conducting hemispheres B and C; both hemispheres have insulated handles. Cover A by means of B and C, and charge the apparatus; after the removal

of B and C, A shows no sign of electrification, whilst B and C remain electrified. The experiment is more striking if performed by first charging A and then placing B and C over it. The electricity that was at first on the surface of A passes to the surface of B and C, and can be removed with them, leaving A completely discharged. The part played by the dielectric in these experiments can easily be traced by the aid of previous explanation.

The Electric Spark.—When in the gap between K and *a* (Fig. 5) the lines become very closely packed they indicate that the electric force in the gap is very great, and it may become so great that the dielectric can no longer stand the strain, but breaks down under it. At the moment when this takes place a spark will be observed in the gap, and a slight sound may be heard. These are veritable lightning and thunder on a minute scale. The dielectric, if a gas like air, immediately mends itself, and no trace is left of the breakdown, but if a solid dielectric be placed in the gap, as, for instance, a sheet of dry paper, evidence of the rupture is left in the shape of a small hole in the paper.

Fig. 8.—Conducting Sphere and Movable Hemispheres.

Action of Points.—As has been shown, the density of electrification depends on the curvature of the surface, and is always greatest where the curvature is greatest. We may imagine every surface to consist of superficies, which, according to the amount of curvature they have, may be parts of larger or smaller spheres. A level plain may thus be said to be part of an enormously large sphere, a point, a sphere infinitely small. The level earth, in comparison with all other movable conductors on its surface, has an infinitely small curvature.

When a conductor terminates in a point, the density must be greatest at that point, no matter how small or how large is the charge of the body itself, for the lines of force coming from the region of space in front of the point tend to crowd on to its small surface.

Storage of Electrostatic Energy (*Condensers*).—Considering the dielectric, as the electrically active body, rather than on the charged conductors, we may regard the electric field as a space occupied by dielectrics and bounded by conductors. This space is in a state or strain, and whilst the electric field exists is a store-house of energy.

Pieces of apparatus designed with this object are known as condensers.

A condenser, then, is usually defined as 'two conducting surfaces opposed to one another and separated by a dielectric,' but a better definition is that a condenser consists of a dielectric bounded by two conductors insulated from one another, the capacity for storing energy being large for the volume of dielectric employed.

Potential.—It has already been explained that the strain energy stored in the dielectric is derived from the work done in separating the electrical charges at the ends of the strain lines or lines of force. Thus, in Fig. 7, as the disc A and B are drawn apart, work is done against the electrical attractions, and the equivalent energy is stored in the intervening and neighboring dielectric.

From Coulomb's fundamental equation: $f=\frac{Q_1 Q_2}{kd^2}$, or $f=\frac{Q_1 Q_2}{d^2}$, if $k=1$.

It is evident that the quantities Q_1 and Q_2 do not specify the amount of work done or energy stored in the dielectric, for, if no third conductor be present, these quantities remain the same whatever distance apart the discs may be. Still the amount of energy stored depends upon Q_1 and Q_2, for these quantities fix the number of lines of force set up. The missing quantity—that is, the ratio between the work done, W, and the charge Q (for $Q_1=Q_2$ in the case cited)—is known as the potential difference between the disc, or, more briefly, as the potential V of one disc A, if the other, B, be arbitrarily assumed to be at zero potential. Thus we have $V=\frac{W}{Q}$, or $W=QV$ for the energy stored in the dielectric in this case.

If the disc, B, at zero potential be supposed to be fixed, W is the work done in moving the + charge Q to the position where it has the potential V. If Q were diminished, V remaining unchanged, the work W $(=QV)$ would be correspondingly diminished. Thus we may say that V units of work are done on each unit of electricity in Q, for this gives the whole work done as equal to $Q\,V$. Hence we derive the following definition of potential: The potential V at any point is the work done in bringing to that point a unit of + electricity from any place at zero potential. In fact, we may regard V as the energy required to stretch the lines of force corresponding to unit charge as the disc A is drawn away from B.

Conversely, the potential may be said to measure the energy with which a body charged with a unit of electricity tends to return to the place of zero potential and the work which it could do in so returning. A simple way of looking at the facts is to regard the + charges as tending always to move along the lines of force towards the negative charges, and the difference of potential between any two positions on a line of force is the work which a unit charge

would do in passing in the positive direction along the line. Thus every point in the electric field has a definite potential, though the charges are only found at the end of the lines. If the field be due to a quantity of electricity Q, at a point A the potential at a distance r from A can easily be shown to be $\frac{Q}{r}$.

Theory of the Condenser.—If K be the capacity of any condenser, and if a quantity of electricity Q raise the potential-difference of its two conductors by V, then

$$Q = KV \qquad (A)$$

If without altering Q we diminish K, then we increase V.

It has been mentioned that the capacity of a condenser depends (1) On the size of the conducting coatings or surfaces; (2) On the thickness of the separating insulator or dielectric; (3) On the 'specific inductive capacity' of the dielectric.

The energy W stored in a charged condenser depends on the product of the charge Q and the potential difference V. When the charge is constant, the potential difference may be varied by varying the capacity. In the more usual case the capacity is constant, and the charge and potential difference vary together. In this case the energy stored is obtained by multiplying the charge by the mean value of the potential difference during the period of charging. Thus we have

$$W = Q \times \tfrac{1}{2}V = \tfrac{1}{2}QV \qquad (C_1)$$

Combining this with equation (A) we get either

$$W = \tfrac{1}{2}KV^2 \qquad (C_2)$$

or

$$W = \tfrac{1}{2}\frac{Q^2}{K} \qquad (C_3)$$

All these results are important. Equation (C_1) is the general case. Equation (C_2) is applicable when a Leyden jar or other condenser is being charged by an electrical machine or a battery where the final potential difference or electric pressure either approaches a certain limit or has a definite value. In these cases the energy stored is directly proportional to the capacity of the condenser.

Equation (C_3) is applicable when the charge Q is fixed, and it is at first sight curious that then the energy stored inversely as the capacity of the condenser. In such a case the largest amount of energy would be stored by using the fixed charge Q to charge a condenser of very small capacity. The reason for this is that for a fixed charge Q the potential increases with decrease of capacity and the energy stored is proportional to the *square* of the potential difference or the square of the charge wherever the capacity of the system charged is constant.

The Electrophorus.—The first piece of apparatus with which electrification by induction was used for the production of fairly large charges was the electrophorus, devised by Volta in 1775, though Wilke had, in 1762, described an arrangement of glass plates, in which the

principle of induction was employed for the production of successive charges.

One form of electrophorus is represented in Fig. 9 in which E is a metal form on which a cake of resin H rests, D a metal disc which is sometimes called the carrier, and G an insulating glass handle.

By rubbing the cake with catskin it is negatively electrified on its top surface. If now the disc be placed upon the electrified cake and touched for a moment with the finger and then lifted, it is found to be positively electrified.

This result will be easily understood by applying the principles already explained to the four distinct stages of the operation, as illustrated in Figs. 10 to 13. In all the figures, the metal plate E is assumed to be connected to the earth. Fig. 10 represents the cake of resin H with its upper surface electrified, and therefore with lines of force passing through the resin (which is a dielectric) and through the air from E to this upper surface; only

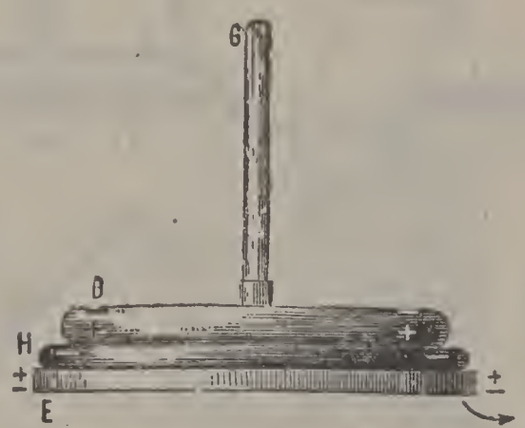


Fig. 9.—Modern Electrophorus.

two lines at each end are shown as passing through the air, for the field in the air will be much feebler than the field in the resin, because of the longer distances. In Fig. 11 the disc D is supposed to be resting on the resin H, but in order that the lines of force may be drawn, a much wider gap than the actual one is shown in the diagram. The presence of the insulated conducting disc on the side farthest from the earth will have very little effect on the distribution shown in Fig. 11; it will only affect the lines passing through the air, which will be cut in two, and those ending on the disc will run to the edge, leaving the air above the disc without any perceptible field, the portions starting from the disc retaining their original positions in the gap.

In Fig. 12 the disc is being touched with the finger, and therefore is brought electrically nearer earth than the plate E. Consequently the greater number of lines will now be in the very thin layer of air between D and H, and only a few will remain in the resin passing from E to the upper surface of H. A figure intermediate between

11 and 12 with the finger approaching D would show some lines starting from D and falling on the finger, an equal number of lines being drawn from the substance of the resin and crossing the air gap from D to H.

In Fig. 13 the disc D is shown as it is being carried away from H by means of the insulating handle. As the disc is tilted the lines starting from it will crowd down to the lower corner near E, and will successively break into two, one part passing from D to E direct and the other from E through the resin to its upper surface. The ends of the lines on the resin must be regarded as approximately fixed, thus accounting for the peculiar dragging action shown in the last figure.

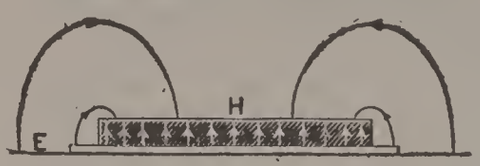


Fig. 10

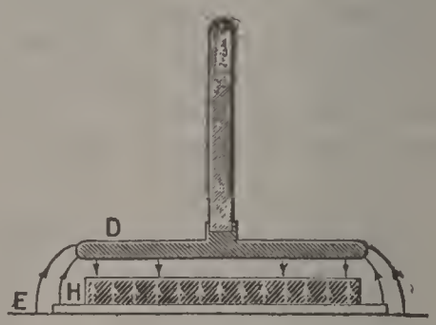


Fig. 11

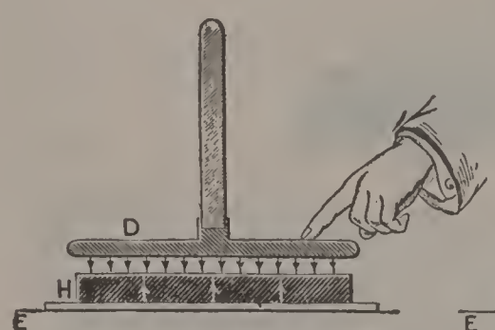


Fig. 12

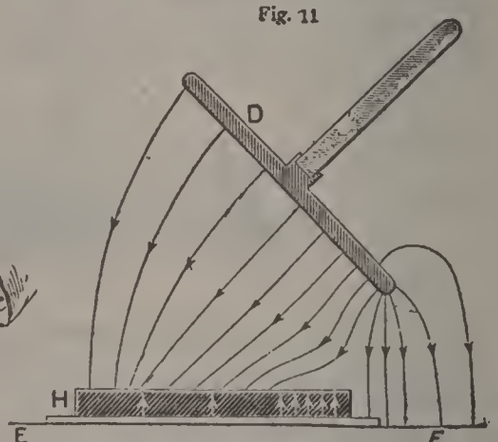


Fig. 13

Lines of Force in Different Stages of Charging Electrophorus Plate.

As the disc is moved farther away more lines pass from it direct to the earth, until finally none of the lines starting from D pass through the air to H. The disc is now charged and independent of H, which has returned to the state shown in Fig. 10. If the charge on the disc be now used and the disc brought back again uncharged, the whole cycle of operations can be gone through once more.

Electrostatic Machines.—The operation of rubbing together and then separating two dissimilar bodies, selected from such as is previously given in this article, is obviously one which can be accomplished very readily by mechanical means.

The Plate Machine in course of time has gone through many alterations; its essential parts, however, remain

the same. Fig. 14 represents the form the Vienna electrician, Winter, gave to it. The principal parts are the glass or ebonite disc S, the rubber R, the two conductors C_1 C_2, and the glass rods G_1 G_2 G_3 G_4 used as supports. On G_1 rests one end of the wooden axis of the glass plate; G_2 supports the other end; G_3 supports a U-shaped piece of wood, which is so arranged that between each limb and the glass plate a rubbing piece R may be inserted. These rubbers consist of flat pieces of wood covered first with some woolen cloth and over this with leather. The leather has a coating of tin, zinc, or mercury amalgam, and is pressed against the disc by a spring, which lies between the limb of the wooden U-shaped frame and the rubber. Both rubbers are connected with the negative conductor C_1. The positive or prime conductor, a hollow

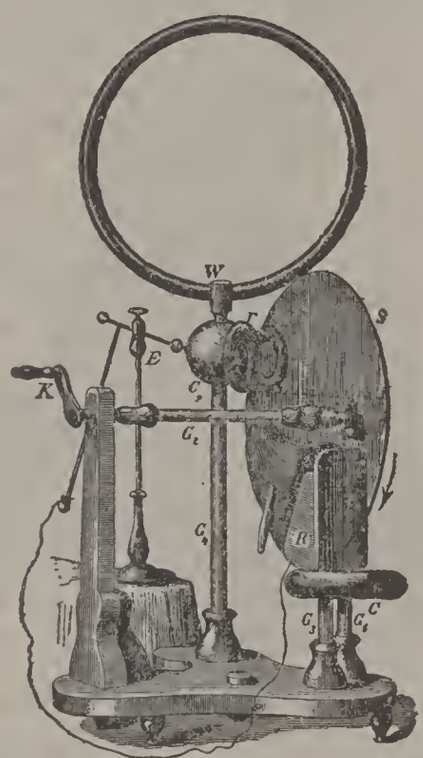


Fig. 14.—Winter's Electric Machine.

brass C_2, rests on the glass rod G_4. Wooden rings *r* run from the brass ball parallel to the glass plate on each side of it; the portion of the ring facing the glass plate is covered with tinfoil, which is in connection with the conductor and carries metal points so arranged as to stand at right angles to the plate and as near to it as possible without touching it. Winter, as a rule, further adds a wooden ring W, which has a spiral of metal in it. Experiment showed him that this ring increases the capacity of the prime conductor and acts exactly as a sphere of the same radius would do. It is a kind of 'condenser,' and on adding the ring, therefore, the length of the spark obtained from the machine is considerably increased. On the side of the conductor C_2 opposite to the two rings is a small brass ball, where the density is always greater than at

any other place on the conductor. A spark will pass most readily from this little ball over to a discharger E, brought near the conductor.

By means of the handle K the plate is turned in the direction of the arrow. The glass plate is rubbed against the amalgamated rubber, and becomes positively charged. Glass being a bad conductor, the electricity does not spread all over the plate, but remains where it is produced. If we continue to turn the machine, these parts of the plate carrying with them the positive electricity will come under the metal points of the wooden rings, *r*. The positive electricity on the surface of the plate induces positive electricity at the farthest end of the conductor and negative electricity at the near surfaces. The latter will now cause a discharge at the metal points of *r* on to the plate S. This will neutralize the positive electricity of the glass plate, and the glass plate will leave the metal rings unelectrified. But new positive electricity can now be produced in the same manner, and the process repeated; if we continue to rotate the plate S, the positive electricity in the conductor C_2 will accumulate. We also know that we produce positive and negative electricity in equal quantities; what, then, has become of the latter? Negative electricity is produced on the rubbers, which, as we have mentioned, are insulated and connected with the negative conductor or C_1. Hence the negative electricity produced passes directly to the negative conductor C_1 and accumulates there. If now we continue to rotate the disc, the collected negative electricity with its associated lines of force will soon have a sufficient density to break down the dielectric and to discharge to earth or even to the prime conductor. In the latter case the machine would be discharged. To prevent this, the negative electricity is passed to the earth by attaching a chain to the negative conductor. By continued rotation the charge of the positive conductor will now increase.

This process, however, cannot be continued indefinitely, as the charge on the positive conductor will ultimately become so great that positive electrification will appear at the metal points on the upper part of the rings *r* and opposite the electrified glass plate which has passed the points on the lower part of *r*. The result will be that the points, acting in the usual way, will discharge the electrification which gathers on them towards the flat glass plate, which will thus become re-electrified, and on balance no further electricity will accumulate on C_1. When, however, the positive electricity is also conducted away, the machine will be a continuous source of electricity as long as the plate rotates. If only sparks are required, the chain suspended from the negative conductor is brought into contact with the discharger, as shown in the figure. If we require negative instead of positive electricity, the chain is removed from the negative conductor and placed on the positive conductor. The negative electricity can then be collected from the lower conductor C_1.

Influence Machines.—In producing electricity by friction, glass rods, etc., were replaced by machines which would perform the operation more continuously; and in a similar manner the principle of the electrophorus has been extended to the construction of what are called continuous electrophori, or electrostatic influence machines. They usually employ the device of bringing a conductor, which has been charged by induction, under cover to completely discharge it. Instruments applying these principles have been constructed by Varley, Thomson, Carre, Holtz, Voss, Wimshurst, and others.

The form shown in Fig. 15 was devised by Holtz, of Berlin. The wooden frame A B supports the well-varnished glass plate E F by grooved rods *d d d* supported on glass pillars. This fixed plate E F has three openings; the one in the middle allows the axis of the rotating second plate C D to pass, the second opening is at *n'*, and the

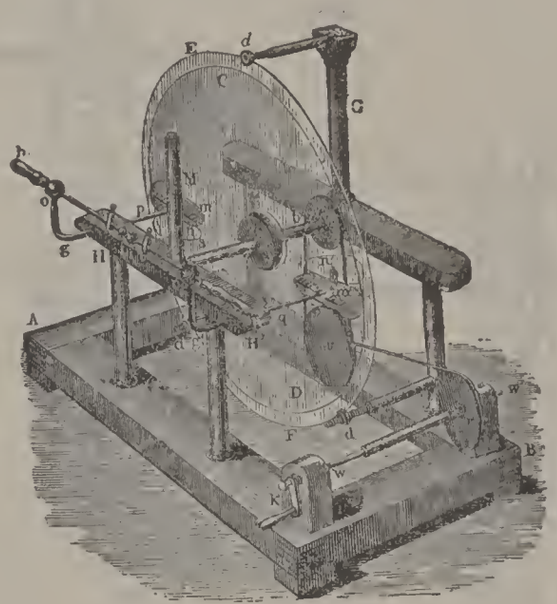


Fig. 15.—Holtz Machine.

third at *n'*. These latter form sector-shaped windows in the plate. Just above the opening *n* and under *n'* are glued on the farther side of the plate E F paper inductors *m m'*, from the edges of which tongues or card project and pass through the windows *n n'*, so as to touch the revolving plate C D. The plates, inductors, and tongues are carefully varnished with shellac varnish. The plate C D can be rapidly rotated in a clockwise direction as seen from the front. Opposite to *m* and *m'* two series of fine metal points are so arranged that C D moves between them and the fixed plate E F. The metal points are held by carefully insulated brass bars *p g ó* and *q g o'*, which terminate in the balls *o* and *o'*, through which metal rods run, having the insulated handles *h h'*, and the small spherical terminals *i i'*, termed the poles of the machine.

To start the action of the machine the balls *i i'* must be brought into contact and one of the paper inductors must be well charged either from a rubbed glass or ebon[illegible]

rod or the plate of an electrophorus, or from a Leyden jar. If everything is in good order brushes will soon appear at the metal points as the rotation proceeds, and if the balls i i' be then drawn apart, a torrent of vivid sparks will pass between them.

To explain this action we must refer to the diagrammatic Fig. 16 in which the portion X on the right represents a vertical cross section through the window n', the conductor m, the descending plate C D, and the fixed plate E F, all on the right-hand side of the machine in Fig. 15; whilst the portion Y on the left represents a similar section through the window n', the conductor m', the ascending plate D C, and the fixed plate E F, all as seen from the left-hand side of the machine in Fig. 15. The paper inductors m m' and the tongues t t' passing through the windows n n' are to be regarded as conductors. The rods

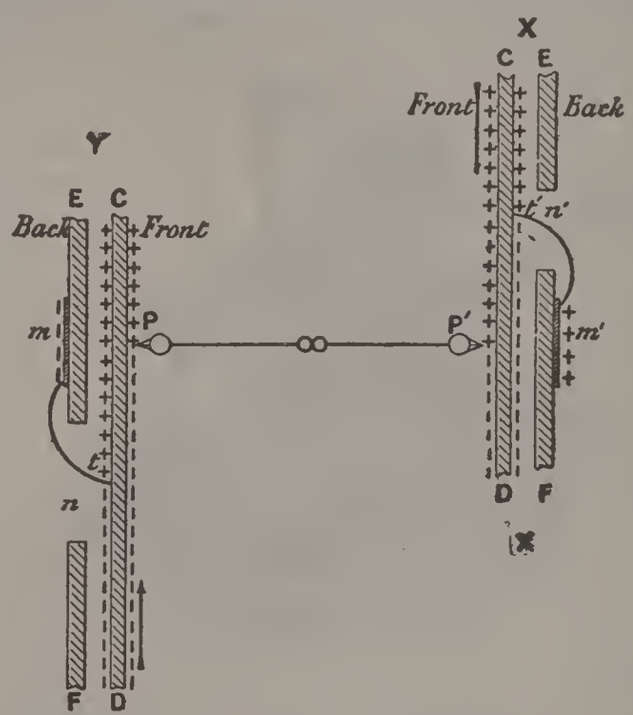


Fig. 16.—Action of Holtz Machine.

P P′ carrying the metal points are represented as joined by a conductor. The diagram is intended to show the condition of things when the plate has made half of a complete turn from the moment that m' received a strong + charge. As the drawing of lines of force would confuse the figure too much, we shall refer only to the charges which are at the ends of those lines.

The first action of the + charge on m' is to induce a — charge on P′ and a + charge on P. These charges are both discharged by the points against the front surface of the revolving plate. The + charge at P also induces a — charge in the inductor m. and a discharge of + electricity from the pointed tongue t against the back of the plate, which, being carried forward opposite m, increases the inductive action of the + charge on the front of the plate, and the + charge on the back of the plate is thereby

still further increased. The plate, therefore, passes forward with + charges on both back and front, but the latter charge is concentrated on a narrower zone. Let us follow these charges round to the X side. The + charge on the back comes first to the tongue t', and is transferred to the inductor m', whose charge is thereby increased. The front + charge causes t' to discharge — electricity on m'. This — electricity, as soon as it passes P′, acts inductively on m', still further increasing the — flow from t' and the + charge on m. Thus, soon both sides of the glass are leaving P with — charges. The front + charge opposite t passes on to the points P, whence it passes over to P, additional — electricity being discharged against the front side by the increasing inductive action of m.

Going back now to the — charge discharged at the starting of the action against the front of the glass at P, this — charge passes round to the Y side, and there, before coming opposite to P, causes the tongue t to discharge + electricity against the back of the plate, thus still further increasing the — charge on m, and the + charge being carried over the top by the back to the X side. The actions described as proceeding at the X side due to the arriving + charges on the glass are repeated at the Y side with the — charges, the signs being reversed.

The action is therefore continuous, for the charges on m and m' are continually increased. The continuous inductions taking place at P and P′ also necessitate a continuous passage of + electricity from P to P′ and of — from P′ to P. These both constitute what is known as an electric current from P to P′, and if the balls in the centre are now separated brilliant sparks will pass between them, for the strains in the gap will be very great and will be continuously renewed as the dielectric gives way. See ELECTRO-DYNAMICS; MAGNETISM.

ELECTRICITY, STATIC. See *Electro-Statics* in ELECCITY, PRINCIPLES OF.

ELECTRICITY, THERMAL: electricity may be produced from a thermo-couple. This is an electric circuit containing two conductors of two different materials, which will cause a thermo-electric current when their two junctions are at different temperatures. A common case is that of a circuit made up partly of iron wire and partly of copper or of German silver. In fact, thermo-electromotive forces are set up in any circuit in which there is any lack of uniformity of material and temperature. A circuit made up partly of hard copper wire and partly of the same wire that has been softened by annealing will have thermo-electric currents set up if the wire is heated at the point where the hard wire joins the soft wire. The electromotive force depends upon the difference of temperature and also upon the materials. When large thermo-electric currents are desired, the different materials should be chosen with great care. Much experimenting has

been done to discover the combinations that give the best results, and special alloys are used by manufacturers of thermopiles. Iron and German silver are frequently used for experimental work, since they are easily obtained, and also give a comparatively high electro-motive force.

The *thermopile* is an apparatus for transforming heat energy into electrical energy. It is the thermo-couple developed by making a circuit of a number of pairs of metals or alloys so arranged that alternate junctions may be heated while the remaining junctions are kept at a lower temperature. If the two conductors are iron and German silver, the heat causes current to flow from the German silver to the iron at the hot junctions. Such currents are called '*thermo-electric.*' The heat is generally supplied by one or more gas jets, although the largest sizes are made like stoves and are suitable for burning coal. The outer junctions are usually kept comparatively cool by means of extended plates, sometimes formed into tubes so as to assist circulation of cooling air.

Thermopiles for measuring radiant energy are arranged in rectangular form. When one end is exposed to any radiation, such as the sunlight or the heat radiated from a fire or lamp, that end absorbs heat and becomes warmer than the other end, the result being a thermo-electro-motive force. If the wires leading from the thermopile are attached to a galvanometer, the electro-motive force and current can be measured by comparing the amount of the thermal current obtained when the end of the thermopile is directed successively toward different sources of energy; the relative intensities of their radiations are indicated by the current through the galvanometer.

ELECTRICITY, Unit Quantity of. See Electricity, Principles of, and Scientific Units.

ELECTRICITY, Voltaic: old name for continuous current.

ELECTRIC LIGHT. See Electrical Illumination.

ELECTRIC METER. See *Integrating Instruments* under caption Electrical Measuring Instruments.

ELECTRIC POTENTIAL: in dynamic electricity it is the same as electrical pressure or voltage. In the case of two oppositely charged bodies their difference of potential is the electrical pressure existing between them.

Electrical pressure corresponds in electricity to head or pounds pressure in hydraulics. Just as the hydraulic pressure or head forces water through a pipe, so does electrical pressure force electric currents through a wire. If a water pipe be closed at one end and a sufficiently high pressure be applied (that is, the difference of pressure between the atmosphere surrounding the pipe and the internal water pressure), the pipe will burst and allow the water to escape. So, if an electric current be closed to the passage of current (that is the circuit opened or interrupted), and a sufficiently high pressure between the wire

and another part of the circuit be applied, the current will burst through the insulation on the wire and pass through the high resistance of the air to the other portion of the circuit, at the lower potential. See CHARGE, ELECTRIC and ELECTRICITY, PRINCIPLES OF.

ELECTRIC RESISTANCE: the property passed by all materials offering opposition to the passage of electric current. Some materials—principally metals—called conductors, offer less opposition than other materials—such as rubber, glass, paper, oil, ebonite, mica, wood and the like—the latter being called insulators. The metals conduct or carry current with but little opposition to the flow, while insulators offer such a great opposition to current flow that they practically cannot be made to carry any current at all. By wires of metal current is carried, and by insulation its direction of flow is confined to those limits and localities where desired. The resistance or opposition to the passage of current causes the generation of heat when current is forced through by an electrical pressure. The amount of heat generated is equal to the square of the current flowing multiplied by the resistance. See CONDUCTIVITY and ELECTRICITY, PRINCIPLES OF.

ELECTRIC TRACTION: the history of the development of electric traction follows closely that of other great technical developments,—starting with experiments on a small scale, having no practical outcome, followed by experiments on a larger scale, showing the physical possibility of the system, and finally using the experience so obtained in a successful, commercial application of the system to practical operating conditions. It was not until the invention and development of dynamo-electric machines made it possible to obtain electrical energy at a reasonable cost that the commercial application of electric traction became possible, and even after that, electric machinery had to be improved before electricity could compete with the existing means of traction. Among the first to study the problem seriously were Siemens, in Germany, and Edison, Field, Daft and Vandepoele in this country. Before 1884 a few roads had been built for exhibition purposes and from that time until 1888, although some small roads were equipped with a few cars, yet it had not been proved that electricity could be profitably substituted on tramways for cable or animal traction. In February of 1888 the Sprague Electric and Manufacturing Company finished the equipment of the tramways in Richmond, Va., with the Sprague Electric Railway system, and operated the road so successfully that railroad managers from other parts of the country were convinced that they had something to substitute for animal traction that would increase their facilities for transportation and decrease the cost of operation. From this time the development of electric roads in the United States has been rapid. At first horse tramways were electrically equipped, then cables were displaced by electric trolley roads, then the tramways were extended

further to the suburbs and surrounding towns, and towns were connected by interurban roads equipped electrically, running at high speeds and offering a service impossible with steam locomotives. For city train service on elevated roads, the substitution of electricity has taken a longer time, as the steam locomotives were efficient and as the changes involved an expenditure which would not have been advisable unless decided advantages with respect to service and cost of operation were shown. In the last few years, however, these advantages have appeared so decided that practically all such roads of the United States have been equipped by electricity. For the heavier work demanded by trunk line traffic now carried on by steam locomotives electricity has made little or no inroad. It is true that the possibility of electric locomotives hauling heavy trains has been demonstrated by the 100-ton locomotives that haul the Baltimore and Ohio trains through the Baltimore tunnel, but with the methods of electrical distribution in vogue and the type of service required, it was only in special cases that electricity showed any advantage over steam for carrying on traffic. Since 1902, however, the development of the single-phase alternating current motor has, to a considerable extent, changed the condition of affairs, and it is probable that there will be a gradual displacement of steam on trunk lines.

Direct-current Railway Motors.—On all the electric roads in this country, and on a large proportion of those abroad, direct-current motors are used for traction. These motors are of the series type, and are usually connected to the axle through a single spur gearing. The characteristics of the direct-current series motor are admirably adapted to traction work. The speed is dependent upon the tractional effort, and the motor slows down when the tractional effort increases, having something of the effect of a variable speed gear; this is very important in practical railway work, for if the motors ran at a constant speed, the energy demanded on grades would be greatly exaggerated, and much larger motors would be required. It is also true that this type of motor gives a greater flexibility to the system, as far as speed is concerned, and this flexibility is important in practical operation. To show the difference between a series motor and a shunt motor, suppose the track resistance is 10 pounds per ton weight of the car; then if the speed were constant (as would be the case with a shunt motor), the power required on a 5 per cent. grade would be 11 times as much as on a level,—air resistance being omitted,—while with a series motor it would be only three or four times as much.

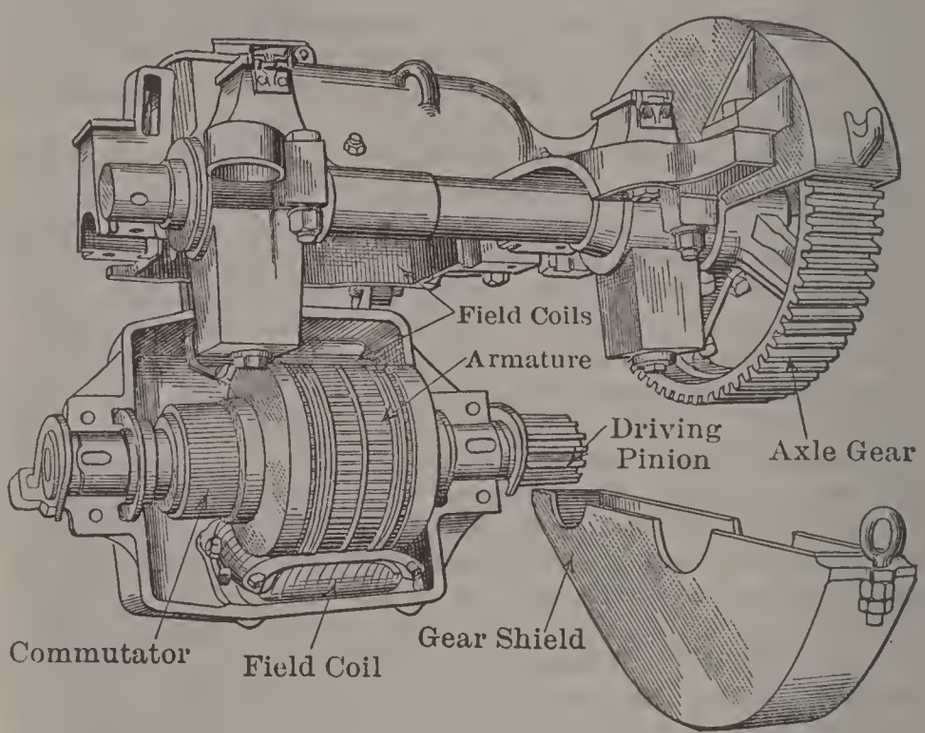
It might be well to briefly trace the development of electric railroad motors in the United States. The motors used by Sprague in the equipment of the Richmond road had too small a capacity for the work required, and very often burned out. They were two-pole machines, of a rated capacity of 7.5 horse-power, and at first drove the

axle through a single reduction gearing; the work, however, was so heavy that it was found necessary to change to a double reduction gearing, the teeth of the pinion stripping on the heaviest grades. These motors were unprotected from moisture, and from the dust and dirt of the streets. The method of suspending the motor, and some of the details of the regulation, are still retained. The field magnets of the motor were sleeved on the axle, thus centring the armature on the axle, and allowing a satisfactory relation between the two. The first motors had a double commutator, which was soon abandoned, as it greatly increased commutator troubles, which were at that time serious. The brushes first used on these motors were of copper, and a number of forms were experimented on, it being necessary to reverse the motor without injuring the commutator. None of the experiments with copper brushes were successful, and it was not until the introduction of the carbon brush by the Thomson-Houston Company that the commutator difficulties were largely obviated.

Soon after the Sprague Company entered the railway field, the Thomson-Houston and Westinghouse Companies took up electric railway work, and greatly aided its development by adding their immense resources to the resources of the Sprague Company. From this time the development of street railway apparatus was rapid. The first motors of all the companies used double reduction gearing, and one of the first improvements, after the introduction of the carbon brush, was the design of a comparatively slow speed motor which allowed a single reduction gearing to be used. The first motor of this kind was made by the Wenstrom Company, and within a short time other manufacturers were making slow speed motors,—some going so far as to attempt gearless motors; the latter, however, were not successful owing to their great weight and lack of efficiency at reasonable speed. Most of the slow speed motors that were made at this time were not thoroughly enclosed, their efficiency being such that a better ventilation than could be obtained by a totally enclosed machine was necessary. The machines were, as a rule, of the four-pole type, with parallel armature windings, requiring four brushes and causing, under certain conditions, unbalancing in the circuits that greatly increased the armature losses and decreased the efficiency. The next step in motor development was made by the Westinghouse Company in what they called their No. 3 motors, a machine much like those at present in use. It had four poles, each of them provided with a field coil, while the armature was provided with what is called a series winding, necessitating only two brushes and doing away with the unbalanced armature circuits of the earlier machines. This type, with the modifications suggested by experience, is the one used in this country at the present time, and almost universally used abroad. The general efficiency of railway motors

at the present time is much greater than that of the motors of 10 years ago, both because of the improved design, and of the fact that better material can be obtained. The field magnets are now made of steel, the pole pieces being built up of thin sheets of soft iron, while the iron laminations of the armature are of such a quality that the losses due to hysteresis and eddy currents are comparatively small.

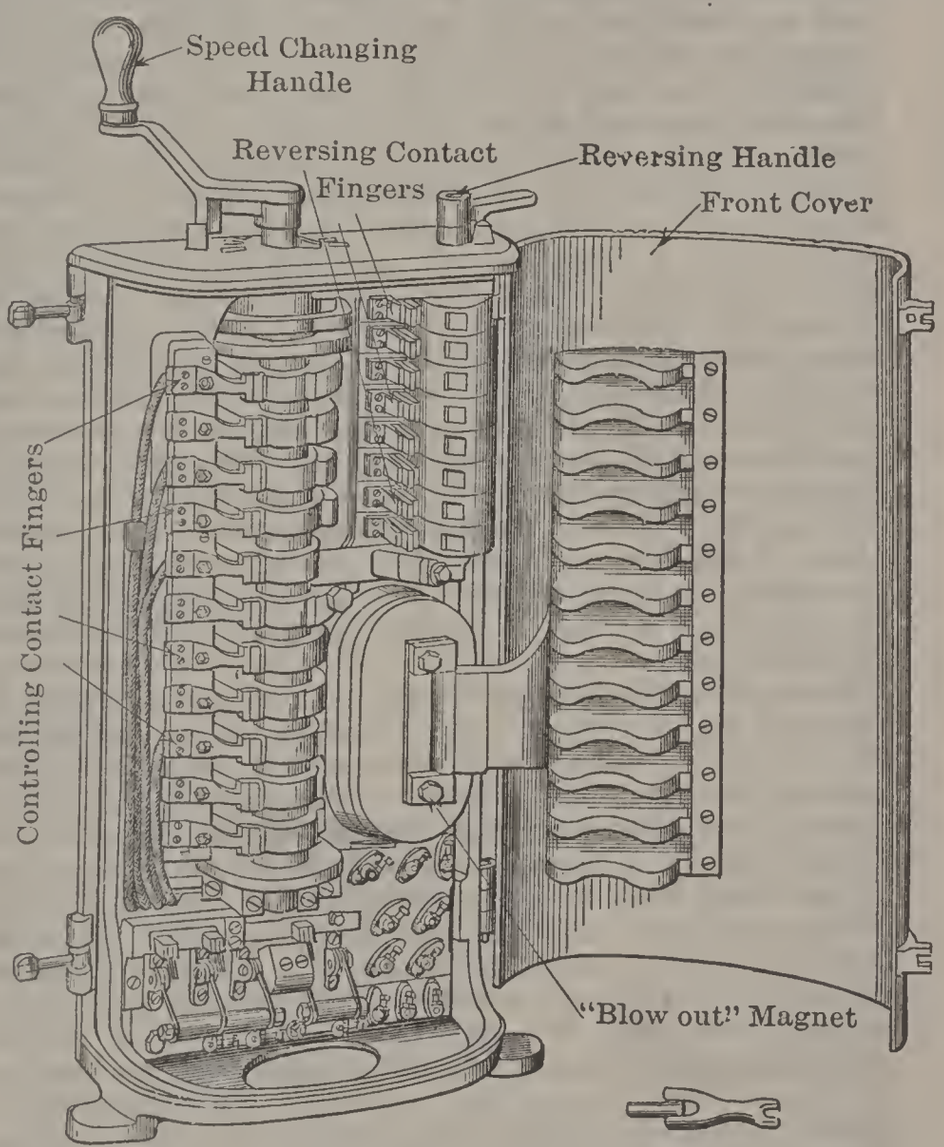
Controllers.—The first method used for regulating railway motors was by inserting resistance in the circuit of the machine; this was modified and developed until, in the Richmond motors of the Sprague Company, the series-parallel system was used, combined with a variable resistance obtained by making different combinations of the coils into which the field windings



Westinghouse No. 49 Railway Motor with gear shield lowered, showing armature ready for removal.

of the machine were divided. On starting, and for slow speeds, the two motors were used in series, while for the higher speeds they were placed in parallel. This system was abandoned, and for some years a parallel system for operating two motors on a street car was used. One difficulty found in the early series-parallel control was the liability of the motors to slip when in series position. The slipping of one pair of wheels would allow the motor connected with these wheels to revolve at such a high speed that its counter-electromotive force would cut off the power from the other, and the car would not start. This difficulty, which always exists, but which is not of importance on ordinary roads, was further complicated by the electrical difficulties in the controller,—the method of control not being as efficient as that used at present. In

the Sprague system, there was no resistance outside of the motors, but the motor fields were divided into a number of coils, and the relations of these coils were varied, giving first a high resistance and a very strong field for a given current, and afterward a comparatively low resistance and a comparatively weak field. The difficulty of this system lay in the fact that all the heating incidental to the low efficiency of the motors on starting, was liberated in the field; and, further, the inductance of the



The "K" Controller open.

fields was greatest at the breaking of the circuit when all the coils were in series. The Thomson-Houston Company modified this by placing a variable resistance directly in the motor circuit, the resistance being regulated by a movable contact arm, controlled by the motorman. This gave better results than the Sprague system, but it also lacked efficiency. In 1891 the General Electric Company brought out a series-parallel controller, similar in some respects to the early Sprague control, but differing from it in the fact that the regulating resistances were not ob-

tained by variations of the different motor field windings, but by resistances outside of the motor. This system, with variations due to different conditions of operation, is still used, and gives excellent results. Perhaps the most important development in controller work was due to the introduction of the magnetic blow-out devised by Professor Elihu Thomson. This apparatus is so placed as to control the breaking of the circuits, and almost entirely eliminates the destructive effects of sparking, due to the breaking. The method of operation is as follows: At first the two motors are placed in series, the resistance being also in series with them; then the resistance is gradually cut out, until finally the motors are in series across the line with no outside resistance in their circuits. Then the resistance is again cut in, and one of the motors is short-circuited; the next operation cuts out the short-circuited motor, the next places it in parallel with the other motor, a large part of the resistance still being in series with them; the rest of the operations consist in cutting out the resistances until finally the motors are in parallel across the line. In the shifting of the circuits, due to the various operations necessary for regulation, any cross circuiting is carefully guarded against by enclosing the different sections in compartments, while the necessary breaking of the circuits is performed in the field of the blow-out magnet,—which practically eliminates the destructive effect of sparking. A reversing switch, included in the controller, is separated from the regulating cylinder, and is interlocked so that it can be operated only when the current is off.

Multiple-unit System of Control.—In urban train service, where a number of cars are operated in one train, with frequent stops, the question of acceleration is of the utmost importance. In order to accelerate quickly, it is necessary to have a large margin of tractive effort on the train,—that is, it is necessary to have a large proportion of the total weight of the train on the driving wheels. When the question of displacing steam locomotives for elevated railway service first came up, and was attacked on the basis of using electric locomotives, the advantages of the latter were not apparent. There was, of course, some advantage in the matter of expense, but not enough to justify the expenditure necessary to change from steam to electric service. Mr. Sprague devised a system by which a number of cars on a train could be equipped with electric motors and controlled from any one of the cars; this system he called the 'multiple-unit' system. At first it was opposed by most of the manufacturing companies and by many electrical engineers. With his customary energy, however, Mr. Sprague worked his system out to a practical demonstration, and to-day all trains operated by electricity employ his fundamental methods. The advantages of this system are these: It gives a large proportion of the total weight of the train on the driving wheels, and at the same time distributes this

weight over the whole length of the train. In the first place, this allows rapid acceleration without slipping of the wheels, and in the second place, it does not impose an undue strain on any elevated structure. It is also possible, of course, to change the number of units on a train without changing the relative weights of the driving mechanism and the car. It furthermore utilizes all the train space for the transportation of the passengers. Its disadvantages, compared with a single locomotive, lie in the fact that it necessitates a greater number of motors, thus adding to the cost of installation and repairs, and it greatly complicates the system of control. These disadvantages are not, however, of controlling importance, as is shown by the fact that it has been introduced on practically all urban trains. Since the first introduction of the system a number of modifications have been made, the most important of them being those of the General Electric and Westinghouse companies.

In the Sprague system, each car is equipped with a controlling device operated by a pilot motor, the motor being operated through a circuit controlled by the motorman. The system is to a considerable extent automatic, as the rate at which the different positions of the controller on each car are changed depends upon the flow of current into the motors, and is not determined by the motorman. This is an important feature of the apparatus, and makes the acceleration uniform, and at a rate to give the greatest efficiency. The General Electric method of control is somewhat different from this, each car having a master-controller, very much like the ordinary tramway controller,—the speed at which the current is cut into the motors being determined by the rate at which the motorman turns the handle of the controller. In the Westinghouse controller, the apparatus which supplies current to the motor is operated pneumatically, the valves of the pneumatic system being worked by magnets in a local circuit, which has as a source of energy a few storage batteries on each car, and is operated by a master-controller on each car of the train. This makes all the operations independent of the line current, and gives very positive and efficient action. In this system also the idea of automatic control, determined by the current flowing into the motors, is utilized.

Overhead Trolley System.—For collecting the current to run electric cars, a number of devices were used, until finally Sprague's success at Richmond fixed a type of collecting device that is still considered standard in this country and is largely used abroad. Until actually determined by experiments, it seemed impossible that a moving contact device could collect the current necessary to supply the energy to the cars without such destructive sparking and heating that it would be inoperative In the first experiments on electric railroading, the current was collected from the rails; afterward it was collected through small carriages running on the overhead wire; and finally

developed into a rotating wheel having a contact on the underside of the trolley wire, and pressing against it by some spring arrangement. What is called a 'bow' trolley was first used,—that is, a wire bent into the shape of a bow, pressing against the underside of the wire, but having no rolling contact. This is still used to a considerable extent abroad, and presents some advantages over the trolley wheel used in this country. A number of modifications of both of these systems have been devised and employed, but to-day they represent what might be called the standard type of construction. The overhead trolley wires, from which the current is collected, are usually of copper; they are either suspended from insulators fastened to a span wire between poles on the two sides of the track, or from brackets fastened to a pole and projecting over the track. In this country they are almost universally placed over the centre of the track, but abroad they are sometimes placed on the side of the road, the trolley being so constructed as to make a side-bearing contact.

Underground Trolleys.—From the earliest application of electricity to railways, attempts were made to do away with the overhead wires used in the ordinary trolley systems. Conduits having a slot through which a current-collecting device could pass were placed beside the tracks or between the rails; conductors were placed in these conduits and the collecting devices on the cars were made to bear against the conductors. At first the conduits were not large enough, not enough space was given for insulation, and the results were unsatisfactory. The first successful system to be installed was a tramway at Budapest, designed by the Siemens Company. Here the conduit was on the side of the track, the tram rail forming part of the slot. The conductor was supported from below by insulators and the system was constructed on a larger scale than had been previously employed,—the details were carefully worked out, and the road has operated successfully from the time of its installation. In the meantime, in this country, the necessity of some such system in the cities of New York and Washington, where overhead wires were not permitted, had forced the different electrical companies to take up seriously the question of conduit construction, with the result that successful systems were worked out for both Washington and New York, the systems being practically the same. The slot in these systems is in the middle of the track. The conduit is constructed as follows: Cast-iron yokes supporting the tram rail and slot rail are placed at intervals of five feet, the rails are attached to the yokes and the whole structure is blocked up in its proper position; then sheet steel is placed between the yokes, forming a tunnel of the proper dimensions, and concrete is packed around the yokes and the forms, supporting the structure in its proper position and forming a tunnel for the conductor rails. The steel forms are then taken out. The conductors are made of T-iron, held from above by porcelain

insulators placed in cast-iron boxes along the track. The details of the different systems that have been installed vary, but the above is practically the standard type of construction. The current for the car is collected by means of what is known as the plow, which passes through the slot and has two cast-iron contact shoes held against the conductor rail by springs; the rail is supported on cross-rods on the car and has a wide limit of lateral motion. It is usual to place ducts beside the track, these ducts containing the feed wires that are connected at various intervals with the conducting rail. The use of the conduit system has not extended in the United States beyond the cities of Washington and New York, but it is largely used abroad in locations where overhead wires are not permitted. The cost of the installation of such a system is much greater than that of an ordinary overhead trolley system, but the cost of maintenance is not, as a rule, as great as that of the overhead system, and it avoids the objectionable appearance of the ordinary trolley wire.

The Generation and Distribution of Current.—In the earlier roads, and, in fact, in most of the roads now operated in this country, the current for the motors is obtained from direct current machines, having a voltage of between 500 and 600 volts. These machines are, as a rule, compounded so that their voltage increases with an increase of load. There are two reasons for this: One is that the increased voltage compensates to a certain extent for the loss of voltage in the distributing system; the other, and most important reason, is that the strengthening of the field prevents the sparking that might otherwise be caused by the armature reactions. It is the custom to ground the negative side of the machines, and connect the trolley wires through what is called 'feed wires' to the positive brushes. These feed wires are carried along the line, connected at intervals to the trolley wires, it being usually the custom to divide the road into sections and feed the different sections from different feed wires. At the voltage which has been adopted as the standard,—that is, from 500 to 600 volts,—the economical distribution when the service is heavy is limited, and if a direct-current system is to be employed for a large area, a number of stations must be installed. For this reason, when the distances are great, it is sometimes necessary to employ a high potential alternating system, reducing to a 500-volt continuous-current system at centres of distribution called sub-stations. On interurban lines, for instance, where the distances are great compared with the number of units in operation, this method becomes imperative, as otherwise the variations of load on the central station would be excessive, and the cost of power would be practically prohibitive. This method of operation may be described as follows: The central station, located at some point where the greatest economy of operation can be obtained, generates alternating currents at a high potential; these alternating currents are taken to the sub-

stations, situated at reasonable distances from one another along the line, and are there changed to alternating currents of lower potential by means of transformers, and then converted into direct currents of the proper potential by means of rotary converters. In this way, a large area can be supplied from one central station, and a comparatively large number of units can be operated at one time from this station, thus giving conditions of maximum economy. On the sub-stations themselves, there is, of course, a fluctuating load, and it is the custom to install storage batteries in connection with the rotary converters to equalize the load; the battery storing energy when the load is light, and giving it out when the load is heavy. Abroad, where alternating current motors are used it is the custom to generate the alternating current at a high potential, and reduce it to a reasonable potential by static transformers along the line.

The Return Circuit and Electrolysis.—In most of the overhead traction systems, the current passing through the motors goes through the wheels of the car to the rails, and then returns to the station, 'bus-bars' finally appearing at the negative brushes of the dynamos. When a system is operated in this way, the rails are bonded,—that is, two adjacent rails are connected by conductors securely attached to the rails, and giving a low resistance to the electric current. If the bonding is good, a considerable part of the current passes along the rails while a small portion strays through the earth to other conductors, such as water pipes and gas mains, using these as a return conductor. If the bonding is bad, however, a considerable portion of the return current is carried by the underground pipes, causing them at times serious injury. For this reason, and also because of the fact that low conductivity in a rail return causes loss of energy, it is of importance that the bonding of the rails should be as thoroughly perfected as possible; it should also be carefully inspected at intervals, as the bonds are liable to break and produce a high resistance between the adjoining rails, thus diverting a considerable amount of current to the underground pipes. The matter of the electrolysis (q.v.) of underground metallic structures received little attention during the first two or three years of electric railroad development; the effect, however, naturally increased with time and the development of the systems until the serious damage that occurred became evident, and means for preventing it was sought. These means, as a rule, consisted in connecting different points of the rail circuit to the negative bus-bars of the station, by return feeders, and in making metallic contacts between the rail and pipes at points where the current was leaving the pipes; also in metallically connecting the pipes near the station with the negative bus-bars. No electrolytic damage is done when the current leaves the pipe through a metallic conductor; it is only when the current passes from the pipe through an electrolyte, such as is

furnished by moist soil, that corrosion takes place. In some places, the joints of the pipes have been insulated to prevent the current from passing through them, and this is perhaps the most efficient means of avoiding electrolytic troubles. It is impossible, in the short space of this article, to thoroughly discuss the question of electrolysis of underground structures due to the return current of electric roads; I think it may be stated, however, that by using a combination of the means stated above, the destructive effects can be reduced to a minimum and made of little practical importance. On underground trolley roads, and on a few systems such as the railways of Cincinnati and the suburbs of Washington, a double trolley wire is used, the current passing to the cars through one wire and returning to the station through the other. This, of course, obviates any difficulties from electrolysis, but is so costly and cumbersome that it is only adopted from necessity.

Alternating-current Motors.—Since the successful development of alternating-current induction motors, their adaptability for railway work has been carefully considered and they have been introduced in several traction situations abroad. In this country, no progress has been made in this direction, for two reasons: In the first place, American engineers have not considered them as offering a successful solution to railway problems; in the second place, at the time of their introduction, railway practice was so standardized in this country that it would have been extremely difficult to fit this type of motor into the situations already existing. There are very few situations in this country that do not involve the operation of cars over already existing systems, and the alternating-current induction motor does not permit this to be done. Abroad, quite a number of roads have been equipped, most of them operating for short distances. The most important drawbacks of the induction motor are these: In the first place, the motor has practically the same characteristics as a direct-current shunt motor, and therefore does not afford the variation of speed with load that is one of the most important and valuable features of a series motor. In the second place, three circuits are necessary to operate the machine, and while the track can be used for one of these circuits, the necessity of two wires over each track, the wires having a considerable difference of potential, makes the practical operation of such a traction system difficult. Numerous systems have been devised for regulating these motors, but they are either complicated or inefficient, and it is the opinion of the writer that induction motors will not be used for railroad work except under special conditions. The only advantage such a system offers is the high potential that can be used, and this advantage is neutralized by the fact that the three conductors necessary make high potentials practically unavailable. In the last three years some very important experiments have been made in Germany on high-speed

work with induction motors. In this case, the three conductors were strung beside the road, the wires being placed in a vertical plane, beside the track with bow trolleys bearing against them. A voltage of 10,000 volts was employed and attempts were made to attain the highest possible speeds. No difficulty in collecting the current from the conductors was experienced at the highest speeds attained, the only difficulty in the operation of the cars being due to the light character of the road construction. The road was rebuilt and in runs made in October, 1903, speeds of over 130 miles an hour were obtained. The data as to the resistance of the trains have not been fully worked out. Since 1902 much attention has been paid to the development of a single-phase alternating-current motor for railway work. A number of types have been experimented on and at present some of the systems are about to be applied to actual commercial operation. These motors are, as a rule, either series motors with special devices to prevent sparking at the commutator, and to obtain the best possible efficiency with a high-power factor, or they have been what is called repulsion motors, in which the armature is short-circuited and the current in the armature is produced by induction from the alternating field. Each of these types of motor has practically the same characteristics as the present. The advantages of such a motor lie in the fact that it can be supplied with high potential alternating current from a single trolley wire, thus doing away with the expensive and uneconomical rotary converter sub-stations; and it offers methods of control that are superior to those used for direct-current machines. The successful development of this motor will make possible the economical application of electricity to trunk lines.

ELECTRIC WELDING: the application of electricity to the heating of metals until they attain a temperature at which they flow and unite. The electric current simply performs the function of heating and has no effect whatever other than this. There are two systems of welding. One depends on the production of heat due to the flow of enormous currents through the parts to be joined. The other makes use of the high temperature of the electric arc.

The first system, known as the 'Thompson process,' is adapted only to uniting parts of small cross section, such as welding iron rods, together end to end. If two rods be placed with their ends abutting and in contact, and current be carried to one rod and back to the dynamos or battery from the other rod, the current will flow through the contact between the two ends. At this point, the resistance is much higher than the resistance of the rods over a short portion of their length. Consequently, a current passing through the rods and the contact between them, will heat the ends of the rods at the contact much more than the other parts of the rods. The heat released by the passage of current is I^2R. in which

I = current and R = resistance. From this it is obvious that the heat released at the adjoining ends is far greater than that released at any other portion of the rods.

By sending a current of proper magnitude through the circuit, the ends of the rods heat, become plastic and unite within a few seconds.

The currents required are very great being about 20,000 amperes for a 1-inch diameter iron rod or 40,000 amperes for a 1-inch copper rod. The voltage, however, is very small, being only from $\frac{1}{2}$ to 2 volts. Consequently the energy required is moderate. Two methods of supplying heavy currents for this work are in use. One is to have a small dynamo working continuously, charging a number of storage battery cells in series. These cells are afterwards connected in parallel and therefore discharge large currents. The other method is to use alternating currents from the secondary winding of a transformer, which has very few turns of winding—from one to three turns—and a large number of turns on the primary. The transformer thus takes say 100 amperes of current at the ordinary potential of 100 volts at the primary and delivers 10,000 amperes at 1 volt at the secondary.

The apparatus used to hold the rods to be welded consists of a stand on which is a pair of copper clamps fixed in position and adapted to fit snugly around one of the rods. Another similar clamp is movable by means of a lever, sliding in a direction parallel to the length of the rods. When the two rods are clamped in position, their ends abutting, current is carried to one rod and away from the other by means of the clamps. As the metal at the adjacent ends softens, the rods are pressed together by the lever which moves one of the rods longitudinally. The union takes place and the soft metal swells out around the joint in a sort of rough ring or collar, which is afterwards ground or turned off.

Welds made in this way show a strength equal to that of the rods themselves.

The arc system, called the 'Bernados process' after its inventor, consists in connecting the two pieces of metal to be welded together, to the positive pole of the dynamo or battery supplying the current. The negative pole is connected to a carbon rod which is provided with a handle and which the operator holds. The carbon is touched against the metal and current begins to flow. Immediately, the carbon is lifted a short distance, say $\frac{1}{8}$ to $\frac{1}{4}$ of an inch and an arc is drawn forming between the metal and the carbon. The intense heat of the arc quickly reduces the metal to a plastic state and the edges to be united are literally melted together. The carbon rod is moved slowly along the joint and the metal melts together as the arc passes along the abutting edges.

This process uses current at from 40 to 60 volts and from 10 to 50 amperes. Its uses are limited to the joining of the edges and it is unsuited to welding thick masses together.

ELECTRODE: any piece of metal, carbon or other material which is a conductor of electricity, and from which electricity passes to reach another electrode, the path of the current being through some medium other than that of which the electrodes are composed. Examples, are battery plates in which the current flows from one, through a liquid to the other, or electric light carbons in which the current passes from one, through the air to the other.

ELECTRO-DYNAMICS: continuously flowing electricity or electricity in motion is termed *dynamic* electricity and the science which treats of it is called *electro-dynamics.*

All of the familiar manifestations of electricity such as light, heat, magnetism, and power, proceed from dynamic electricity.

In electro-statics (see ELECTRICITY, PRINCIPLES OF) it is shown that if a potential be produced between two bodies, not in contact, a certain quantity of electricity is stored on the surfaces of the bodies, and if they be joined by a conductor, an instantaneous current flow results, the potential is equalized and flow ceases. The quantity of electricity is also very minute in even the largest surfaces.

If the two points of opposite potential be joined together and some provision made for constantly maintaining the potential, electricity will flow continuously from the positive to the negative poles.

An example of such an arrangement is the ordinary chemical electric battery (see BATTERY, ELECTRIC) which maintains a given potential between the two plates and causes continuous flow of current.

Before proceeding with the study of electro-dynamics it is necessary to explain the electrical units in general use.

The *unit quantity of electricity* is the *coulomb* and is equal to that quantity of electricity which will deposit 0.001118 grams of silver on a platinum plate immersed in a solution of silver nitrate.

The unit quantity of electric *current* is the *ampere* and is equal to *one coulomb flowing per second*, being the same kind of a unit in electricity that the quantity of a gallon of water per second flowing in a pipe would be in hydraulics.

The unit of *electrical pressure* or electro-motive force is called the *volt*, and is equal to that pressure which will cause one ampere to flow through a circuit having a resistance of 1 ohm.

The unit of *resistance* or opposition to current flow is called the *ohm* and is equal to the resistance of a column of mercury one millimeter in diameter and 106 millimeters long at a temperature of 60 deg. F.

The ampere is also defined by its magnetic effect. If a coil of wire be bent into a circular loop having a radius of one centimeter and with its ends almost touching, so

that the circle is practically complete, and current be passed through this loop, the magnetic force exerted on a unit magnetic pole placed at the centre of the loop, tending to urge the magnetic pole, along the axis of the coil, is $6.28 = 2\pi\gamma$ dynes per ampere of current passing through the loop, that is; one dyne pull for each centimeter length of circumference of the loop. One dyne = $\frac{1}{981}$ gram or $\frac{1}{445000}$ lbs. avoir.

The volt is also defined as that pressure generated by the cutting of one hundred million ($= 10^8$) magnetic lines per second.

The *Farad* is the unit of *capacity* and is equal to that capacity which will store one coulomb with one volt pressure between condenser plates which are separated one centimeter, the medium or dielectric between them being air. This capacity being greatly in excess of any possible condenser, the practical unit is the *micro-farad or one millionth of a farad.*

The unit of *inductance* is the *henry* and is equal to that inductance in which one volt will be induced when the current in the inductance changes at the rate of one ampere per second.

The *Watt* is the unit of power and is the product of the pressure multiplied by the current or, = volts $\times$ amperes.

This unit is very small and the *Kilo-Watt* (abbreviation K. W.) equal to *one thousand watts,* is most often used. The K. W. is equal to 1.34 horse power or 746 watts are equal to one horse power. See UNITS, SCIENTIFIC.

Whenever current passes through any path, it is caused to do so by the electrical pressure which corresponds in electricity, to pounds pressure or 'head' in hydraulics.

The conducting path is never perfect; some metals are better conductors than others, but even the best, such as silver and copper, offer resistance to the passage of the current, and the electrical pressure overcomes this resistance and forces the current through the path. Since any motion, whether molecular or otherwise, which is resisted, produces heat, it follows that the passage of current through a wire, also releases heat and raises the temperature of the wire, or the reason of the heat may be ascribed to the loss of energy in the wire, which takes place without doing work and which therefore must appear as heat. The energy lost is the product of the current by the 'Volts drop' in the line, and the heat evolved is strictly proportional to this energy.

'Volts drop' means the actual volts pressure used to force the current through a wire. If the wires lead to an incandescent lamp which requires a pressure of 100 volts and a current of $\frac{1}{2}$ ampere, and the resistance of the wires be such that 5 volts are required to send $\frac{1}{2}$ ampere through the wires, the voltage of the source of electricity must be 105 volts and the volts drop = 5 volts, giving 100 volts at the lamp. The energy then to heat the wire is volts drop

$\times$amperes $= 5 \times \frac{1}{2} = 2\frac{1}{2}$ electrical units of energy or *watts.* If with a given resistance, a greater pressure be applied, a greater current will flow, or with the same voltage, if a wire of smaller resistance be put in the circuit, a greater current will flow. The relationship between current, electrical pressure and resistance are shown by the equation $I = \frac{E}{R}$ in which I = current in amperes. E = pressure in volts, and R = resistance in ohms. This is known as *Ohms Law* and is the fundamental law of electro-dynamics.

Since from this equation $E = RI.$ and the heat released by the passage of current is equal to $EI.$, it follows (by substitution) that the heat also equals RI^2. This latter equation is known as *Joules Law.*

As has been shown in the article on MAGNETISM, whenever a current flows, magnetic lines are produced which tend to form concentric rings around the conductor and will form these rings unless they are diverted or neutralized by other magnetic forces or influences. Oersted discovered that if a magnetic needle be brought near a wire carrying current, the needle, if free to move, will set itself at right angles to the wire, that is, the needle places itself so that its magnetic lines and those surrounding the wire are parallel. Conversely, if a magnetic needle be placed near a wire and turned around on its pivot an electrical pressure will be generated in the wire and current will flow, if the wire form a complete circuit. This 'induced' electrical pressure is produced by the cutting of the magnetic lines from the magnet as the latter is turned around. *Hence we ascribe the mechanical production of any electrical pressure to the cutting of magnetic lines by the conductor in which the pressure is generated.*

Also whenever magnetic lines are cut, no matter how or under what conditions, an electro-motive force or electrical pressure is produced. This cutting may arise from (1) moving the lines of force across the conductor, or (2) moving the conductor through the lines of force, or, (3) by the formation and removal of lines of force in a magnetic body near a conductor, the cutting taking place as the lines spring out and cross the conductor and as they re-cross in an opposite direction on collapsing.

The direction of the pressure and resulting current flow depend on the direction of the lines of force and the relative direction of motion between the conductor and the lines.

Consider Fig. 1, which shows a magnetic field and its direction between poles NS. The conductor AA′ when moved *downwards* through the field generates an electro-motive force in a direction towards the observer, that is from A′ to A. If moved *upwards* the voltage will be in the opposite direction. Likewise if the N pole were S and *vice versa*, the voltage for the upward or downward movements would be reversed. Obviously, if the con-

ductor AA′ were moved *along* the lines of force from N to S there would be no cutting and no pressure generated. In order for current to flow, a complete conducting path must be provided, which in this case is made up of the conductor AA′ and the flexible wire joining the two ends of the conductor as shown.

The intensity of the electrical pressure generated depends on the rapidity with which the lines of force are cut. If the total number of lines in a magnetic field cut by a conductor is one hundred million, and the conductor cuts them all in one second, one volt is produced, the volt being the pressure induced by a rapidity of cutting equal to one hundred million lines per second. More rapid cutting will produce higher voltage, and if all the lines are cut twice in a second, that is, all cut in one-half second, the pressure would be two volts, or if all were cut in one-tenth of a second the pressure would be 10 volts. Of course it is evident that if the magnetic field be made one-

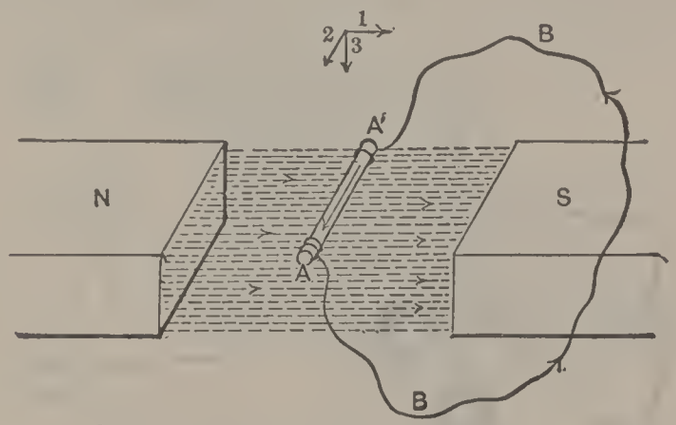


Fig 1.

tenth as strong or ten million lines total, and cut in one second, the pressure would be one-tenth as great or one-tenth of a volt for a single cutting in one second by the conductor. If the conductor cut this smaller number of lines ten times as fast, however, the voltage will be correspondingly increased and equal to one volt for the case just cited. It is easy to compute all electro-magnetic actions by keeping in mind that a volt is equal to one hundred million lines cut per second, and the rate of cutting for any one conductor is $=\frac{N}{T}$ in which N = all the lines cut in one complete movement of the conductor and T is the time in seconds or fraction of a second, taken to effect the movement of the conductor, completely through all the lines. For any number of conductors joined together in series, i. e., so that their pressures add themselves together, the volts produced is equal to the sum of the voltages produced in each conductor. Thus for 100 conductors joined in series passing through a magnetic field of

three million lines in one-fortieth of a second, the rate of cutting per conductor would be $\frac{3{,}000{,}000}{\frac{1}{40}} = 120{,}000{,}000$ lines cut per second. Dividing this by 100,000,000 which is the rate of cutting to produce one volt the volts per conductor = 1.2. For 100 conductors the pressure is therefore 120 volts.

The formula for computing the volts produced therefore is $\frac{n\,N}{T + 10^8}$ in which

n = number of conductors in series.
N = Number of magnetic lines cut.
T = time of cutting.
10^8 = 100,000,000.

The current induced in a conductor only lasts so long as the conductor is actually cutting the lines of force;

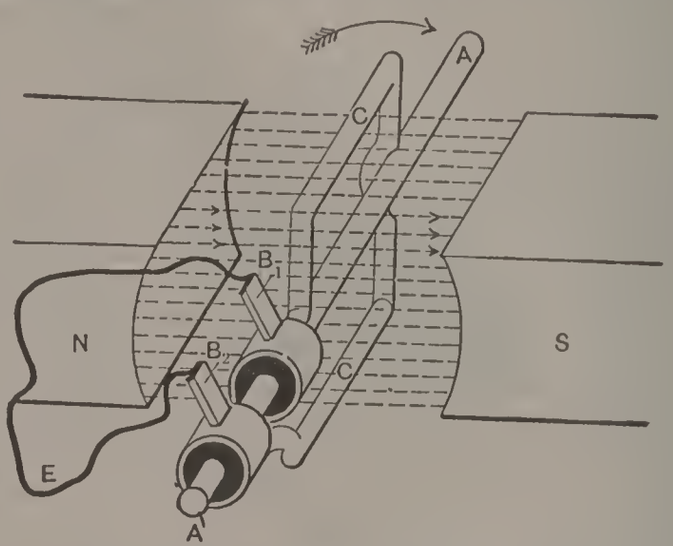


Fig. 2.

hence, in order to keep a current circulating in a conducting circuit, it is necessary to keep the conductor continually cutting the lines of force. This is most conveniently effected by fixing the conducting circuit upon a spindle, and revolving it in a magnetic field. Such an arrangement is represented in Fig. 2, where A A is a spindle capable of revolving in the magnetic field between the north and south poles of the magnet N S. To this spindle is fixed the double conductor C C, the two ends of which are connected to two metallic rings fixed upon the spindle, and insulated from it and from each other. Two brass brushes, B1, B2, press upon each of these rings, and serve to convey the current generated in the conducting circuit C C to the external circuit E. If now the loop be first placed in the vertical plane, as shown, the lines of force will thread through it at right angles. As the loop is moved through the lines of force in the direction of the arrow during a complete revolution, the limbs of the loop will

cut through the lines of force; and in consequence, electrical pressures and currents will be generated in the loop, which will be found to be directed as follows:—Whilst the loop is passing from 0° to 180°, or through half a revolution, the voltage and current induced in the limb descending on the right will be directed from back to front, and in the opposite direction, i.e., from front to back, in the limb which is ascending on the left. On passing the 180° position, the limb which was previously descending on the right will begin to ascend on the left, and the limb which was previously ascending on the left will now begin to descend on the right. On passing the 180° position, the limbs will therefore have voltage and current induced in them *opposite* in direction to those which previously flowed through them during the first half-revolution. As a result, the current flowing in the external circuit E will also be reversed at every half-revolution of the spindle, or the current will be an *alternating current.* As the value of the voltage and consequently the strength of the current, generated in the con-

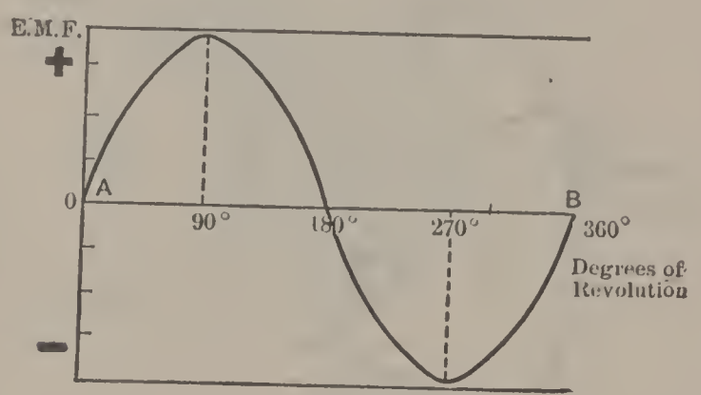


Fig. 3.

ductor by its motion in the magnetic field is dependent upon the rate of cutting lines of force, or upon the number cut per second, we may examine how this varies during a complete revolution. As the loop moves out of the vertical plane during the first quarter-revolution, it at first moves nearly parallel to the lines of force, and consequently the rate of cutting lines is a minimum. As the rotation is continued, the rate of cutting lines gradually increases, until, upon reaching the horizontal position, the loop moves at right angles to the lines of force, and the rate of cutting lines is therefore a maximum.

Upon moving out of the horizontal position the rate of cutting lines will gradually decrease until a half-revolution has been completed, when the loop will again be moving parallel to the lines, and consequently the rate of cutting lines will again be a minimum. The same thing will be repeated during the remaining half-revolution, with the difference that the voltage and current will be reversed in direction, as already explained. From this it will be seen that the voltage and current generated in

the loop during the first quarter-revolution, or from 0° to 90°, will rise gradually from zero to a maximum value, and then fall to zero again during the completion of the half-revolution, or from 90° to 180°. From 180° to 270° the voltage will again rise from zero to a maximum, and again fall to zero as the loop moves from 270° to 360°. This rise and fall of the voltage during a complete revolution of the loop is graphically represented in Fig. 3, where the various positions of the loop during a complete revolution are indicated upon the horizontal line A B, which also indicates zero potential, and the vertical lines represent the value of the voltage set up in the loop at these positions. The portion of the curve above the horizontal line indicates the *positive* direction of the voltage generated during the first half-revolution of the loop, that portion below the line the reverse *negative* direction produced by the second half-revolution.

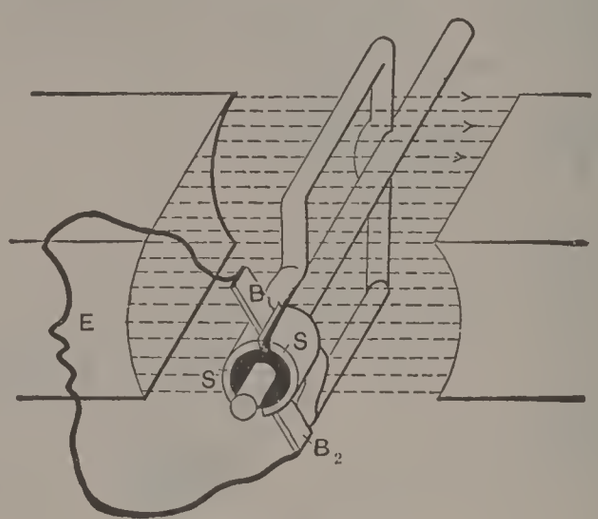
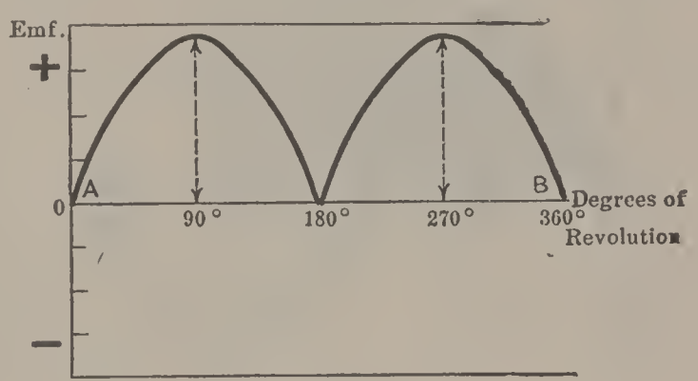


Fig. 4.

Commutating Current.—The arrangement of the loop or conducting circuit, as described, constitutes what is known as an alternating current dynamo. A large number of the practical applications of electricity are effected, however, by means of *continuous currents* generated by continuous current dynamos. In this class of machine the necessary alteration in the direction of the current is effected by a process called '*commutation*,' the appliance for effecting the alterations in the direction of the current being called a '*commutator*.' This appliance, in its simplest form, consists of two metallic segments S S, insulated from each other by means of a cylinder of boxwood or other insulating material, as shown in Fig. 4. The circuit is arranged upon a spindle as before, and the commutator is fixed upon the spindle in place of the two rings, and one end of the conducting coil or loop is connected to each of the segments. Two metallic brushes or springs, B1, B2, press upon the segments, and convey the current generated in the coil to the external circuit E, as indicated.

Upon a little consideration, it will be apparent that, if the brushes are so placed that one segment slides out of contact as the other slides into contact with the brushes, at the moment the current is reversed in the coil, during certain periods of revolution, the current flowing in the external circuit will be 'commutated,' or will always flow in one direction, although the relative directions of the current flowing in the revolving coil or loop will be unaffected. Fig. 5 shows the curve of commutated current.

Effective Value of Current.—As has been shown, the *heating* effect of any current is equal to $1^2 R$ when I = current and R = the resistance. Since the alternating and pulsating currents described, are continuously varying in value, differing from a steady flow such as is supplied by a battery, its heating effect also varies as the square of the current at each instant changes, and is computed as being the *square root of the mean* or *average of the squares of the various successive values of the current.* If, for instance, a number of vertical lines be drawn from the



'Fig. 5.

line A B (Fig. 6) to the curve, these lines spaced equally distant apart but very numerous and close together, and extending along A B from one point at which the current is zero to the next, i.e., from A to 180° this square root of the mean square value may be closely approximated. Measure accurately the length of each line to some assumed scale, and square the value of each length. Add all the squares thus found and divide this amount by the number of lines measured. This gives the *mean* square of the values. Extract the square root of the mean square and the result is the *effective value of the current as compared with the maximum value.*

The *average* value of all the vertical lines drawn that is, of the successive values of the volts generated is approximately 0.6366 of the *maximum value,* that is of the value at 90° or 270° in the figure; while the *effective* value is 0.707 of the maximum. These values are based on the assumption that the curves are *sine curves.*

A sine curve is one which results from the following relation:

If from A towards B (Fig. 6) equal distances from A along line A B represent equal angles, and vertical lines be drawn from the line A B each line having a length equal to the sine of the angle which is represented by the distance of the line from A, the scale selected being any convenient one, the curve passing through the ends of the verticals will be a sine curve. This may be stated mathematically thus: if the abscissæ of the curve represent angles and the ordinates at any point are proportional to the sines of the corresponding angles, the curve is a sine curve.

Alternating current dynamos and devices do not produce pure sine curves of pressure and current, but they nearly approximate this form and as the mathematical investigations are greatly simplified by the assumption that the curves are of the sine form and the computations on this basis conform to the practical results within very close limits, it is usual, except in isolated cases, to so consider all alternating current waves.

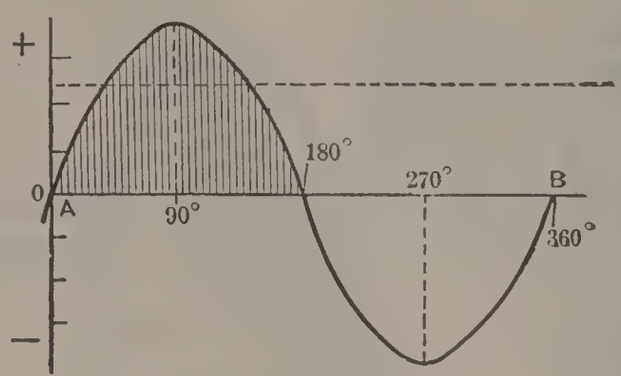


Fig. 6.

In the case of a continuously flowing current having a constant value,—such as is supplied by an electric battery, the value at any instant is the same as that of any other instant and therefore, the graphic representation of current value would be a continuous horizontal straight line at a height to some assumed scale above the reference line equal to its current value measure at any time, as indicated by the dotted horizontal line in Fig. 6. Obviously its square root of the mean square is the same as the height of the line above the reference line A B.

Frequency.—The voltage and current from an alternating current loop revolved in a magnetic field, rises from zero to a maximum, descends to zero again, rises to a maximum in the opposite direction and again comes to zero for each revolution. The complete action from the first zero to the last position of zero or from one maximum point to the next maximum in the same direction (Fig. 6), represents one complete *cycle*. In a two-pole field there is obviously one cycle passed through for each revolution. If the conductor is revolved in a four-pole field, the cycles per complete revolution are two, and in an eight-pole

field the cycles would be four. *The number of cycles per revolution are equal to the number of pairs of poles in the magnetic field.*

The frequency of an alternating current dynamo is the number of complete cycles passed through per second. Thus a loop rotating 240 times a minute in a two-pole field, rotates 4 times a second and the frequency is therefore 4 cycles per second. In an eight pole field at the same rotative speed the frequency would be 16 cycles per second.

The frequency therefore is equal to the revolutions *per second* multiplied by the number of *pairs* of poles.

Self-Induction.—If a current be passed through a coil of wire, wound about an iron core or about any magnetic circuit, magnetic lines are formed, and thread through the coil as shown in Fig. 7 (see MAGNETISM). As these lines spring into place they cut the coil loops or turns

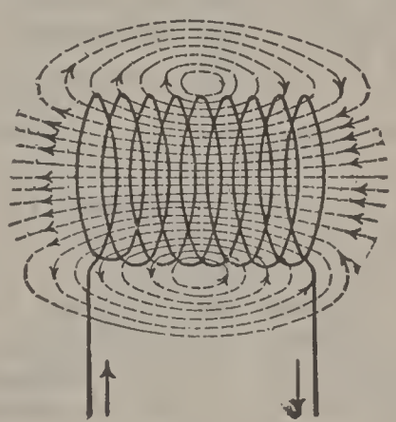


Fig. 7.

and thereby produce a voltage in the coil. This voltage is therefore self-produced by the action of the current in beginning to pass through the coil.

This voltage is produced only when current first begins to pass through the coil, if the current be steady and not variable. After the lines of force spring into existence, they are maintained and no longer cut the lines. Therefore the self-produced voltage lasts only through the instant during which the lines are forming. This self-induced pressure *opposes* the pressure which is forcing the current through the coil. There are, therefore, two pressures acting on the circuit, one from the dynamo or battery, the other from the coil. *The net pressure is the resultant of these two* and the current flow through the resistance is proportional to this net pressure.

Any change in the current produces a change in the magnetic lines and therefore produces an electric pressure. If the circuit be interrupted and current flow ceases, the magnetic lines collapse and thereby cut the turns of the coil, again setting up an instantaneous pres-

sure. The direction of the pressure in this case is such as to momentarily maintain the current flow even though the dynamo or battery is not any longer connected to the circuit.

Lenz's law of self-induction is that the direction of the self-induced voltage is such that it *always opposes any change* in the value of the current.

Any coil of wire in a circuit is called *an inductance* and any inductance will prevent the current from rising *instantly* to its full value, for the lines are forming and cutting the coil most rapidly at the instant the current is started through the coil and the opposing, self-induced voltage is therefore greatest. Conversely, an inductance tends to prevent the current from ceasing to flow when the circuit is interrupted, and retards its cessation.

The Time Element of an inductive circuit is the length of time in seconds or fraction of a second required for the current through the circuit to attain .6366 of its final value and is equal to the inductance of the circuit in henrys, divided by the ohms resistance, or, $T=\frac{L}{R}$ where L = henrys of inductance, R = ohms resistance, and T = time.

The value of the voltage produced by a current change through an inductance is the same as that produced in any other mechanical way, viz., one volt for 10^8 lines cut per second. If one ampere flows through a coil and it is increased gradually and uniformly to 2 amperes in one second, and thereby a volt is induced, the inductance of the coil is one henry or unit of inductance. Any coil therefore, which sets up a number of magnetic lines for one ampere passing through it, such that the lines multiplied by the number of turns in the coil is equal to 10^8, has an inductance of one henry.

Since a circuit may be interrupted or 'opened' in a very short time, say $\frac{1}{600}$ of a second, the voltage which would be induced in a coil of one henry inductance would be high as the rate of cutting is proportional to the rapidity of collapse of the lines.

In continuous current work the self-induced voltages being of practically instantaneous duration only at the time of making or breaking the current, inductances play only an unimportant part.

In alternating or pulsating current work, however, inductances are highly important, for the current changes continually and rapidly, thereby producing at *all times* pressures in the inductances. Consider the curve of variation of current from an alternating current dynamo as shown in Fig. 6. At the point where current is zero and passing from a positive to a negative value, it is changing its value at its most rapid rate, and therefore the lines of force in the coil, through which this current passes and produced by the current, are changing at their most rapid rate, which produces the maximum voltage of self-induction. At the instant when the *cur-*

rent is a maximum; that is, at the peak of the curve, it is not changing at all but remains constant for a short instant of time in passing from the condition of *increasing to decreasing*. Therefore, at this instant, the self-induced lines of force are not changing and hence no pressure is generated in the inductance. From this it follows that the voltage of the inductance is *zero when the current flowing is a maximum and is a maximum when the current is zero* (see Fig. 8). The curve i i i i is the curve of current from an alternating current dynamo. Curve LLLL, is the curve of self-induced pressure having its maximum at the instant when the current value is zero and, its zero at the instant when the current is at its maximum. It is understood that the line A B represents the amount of rotation of the loop starting from its vertical position as shown in Fig. 2, measured in either *degrees* or *time*, the angle turned through being propor-

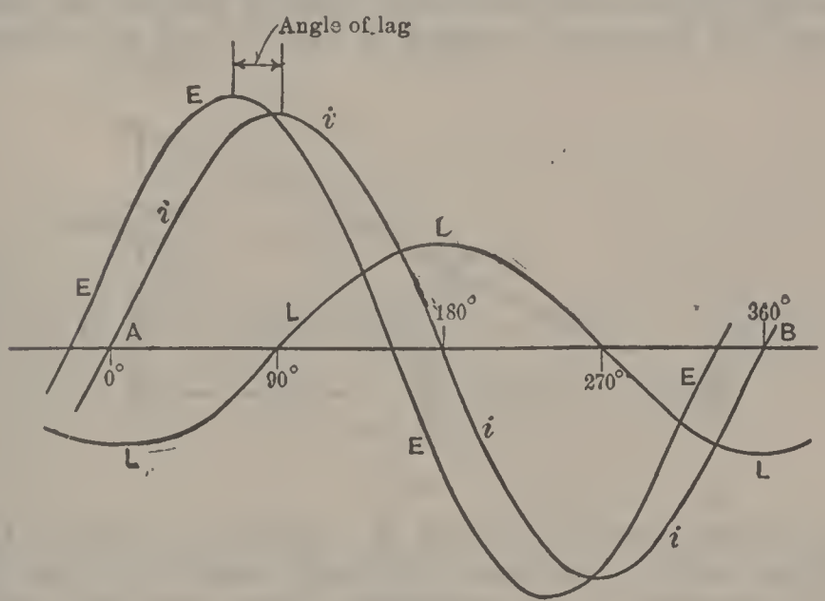


Fig. 8.

tional to the time taken to turn through the angle. Since the dynamo loop which generates the pressure which causes the current flow, turns through an angle of 90 degrees before the voltage of self-induction begins to rise in the same direction, the *self-induced* pressure is said to be 90 *degrees behind the current* and thereby reaches its maximum value when the current has become zero as shown.

If the resistance of the circuit to which the loop is connected be one ohm, the curve of resultant voltage, that is, the actual pressure to send the current through the resistance, is the same as curve of current as $E = R\ I$ and, if $R = 1$ $E = I$ at any instant. To find the pressure which must be generated in the rotating loop to send the current through the circuit, the pressure required to overcome the resistance must be added to that of the inductance. The pressure which results from combining these

two is shown by the curve E E E E. This is obtained by adding algebraically, the self-induced pressure at any instant from the resultant pressure at the same instant. This means that when at any point both curves are on the *same* side of the line A B the values are *subtracted*, but if on *opposite* sides the values are *added*.

The following relations exist: The pressure generated by the loop, reaches its maximum before the current flow reaches its maximum, and considerably before the pressure generated by the inductance reaches its maximum. The *time relation* of these quantities is called *phase*. When no inductance exists in a circuit the pressure from the rotating loop is the only one acting and consequently the loop pressure and the current flow, rise and fall at the same times and are therefore said to be *in phase*. With inductance in the circuit the current is not in phase with either the loop or the inductance pressures, but with their *resultant*, and as the loop or impressed voltage rises to its maximum value before the current reaches its maximum, the impressed pressure is said to *lead* the current.

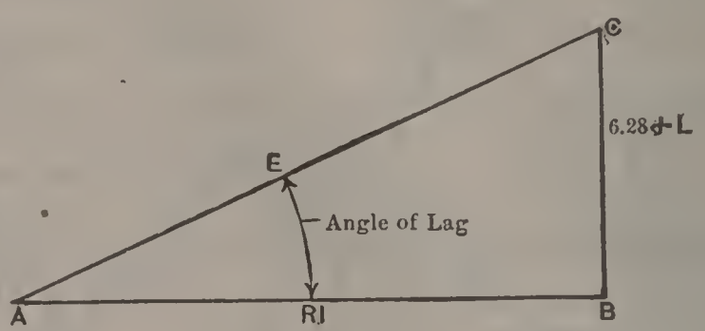


Fig. 9.

The distance from the point of maximum voltage to that of the current maximum measured parallel to the line A B represents, to the scale of the figure, a certain number of degrees and there is said to exist an *angle of lag* between the current and the pressure, generated by the loop of this number of degrees.

The fact that the self-induced pressure '*lags*' 90 degrees behind the current makes the mathematical computations very simple. If a horizontal line A B in Fig. 9 represent the pressure used in passing a current through a resistance which is equal to I R, then at 90 degrees to it, the line B C represents the pressure produced in the inductance. The dynamo or loop pressure is then the combination of these two or the line A C the length of which represents the magnitude of the pressure to the same scale that has been adopted for I R and its angle with A B represents the angle of lag.

The inductance of any coil increases as the *square* of the number of turns in it, if the current through it be maintained the same. The reason of this is easily seen from the following:

A coil of 1,000 turns and one ampere passing through it gives 1,000 ampere-turns and sets up a certain number of magnetic lines. If the number of turns be doubled, and the current remain the same the ampere turns, and consequently the number of lines are also doubled.

Therefore, *the voltage per turn* or loop of the coil will be doubled for a given rate of change in the current passing through the coil. Since the *number of turns* has also been doubled, it follows that the self-induced voltage will be four times as great with 2,000 turns as with 1,000.

To compute the self-induced voltage, take the reluctance of the magnetic circuit, and the number of ampere turns in the coil or coils. From this, calculate the total number of magnetic lines that will be produced at the instant when the *maximum* amperes pass through the coil, (see MAGNETISM). Multiply this quantity by the number of turns in the coil. This gives the total cutting of lines when the current varies from zero to its maximum.

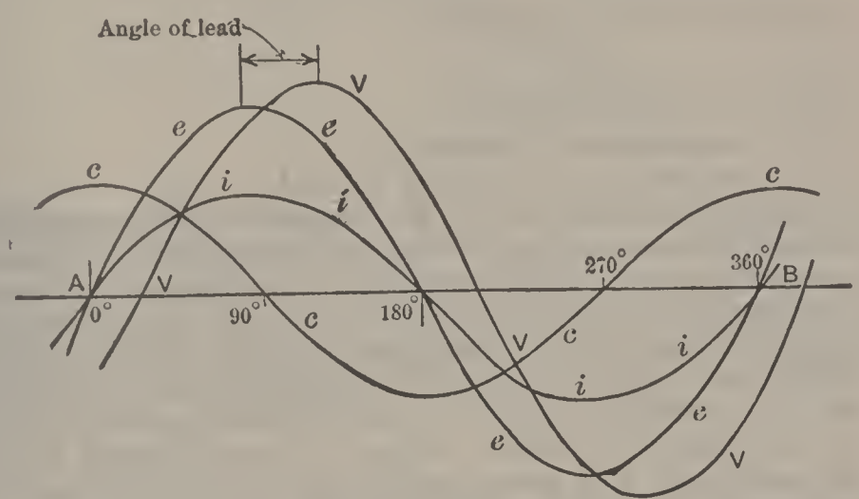


Fig. 10.

Divide this last quantity by the time, in seconds or fraction of a second, required for the current to pass from zero to maximum, or from maximum to zero. This gives the rate of cutting of the magnetic lines. Since it requires a rate of one hundred million lines per second to produce one volt, the last found quantity must be divided by 100,000,000 and the result is approximately the number of volts for a change of current from zero to maximum or *vice versa*. In taking the time it must be remembered that the period to be considered is that required to rise from zero to maximum or from maximum to zero. In the case of alternating currents this occurs four times during each cycle, i.e., (1) from zero to + maximum; (2) + maximum to zero; (3) zero to—maximum; (4)—maximum to zero.

The actual voltage is 11 per cent. higher than the result as obtained above, when the current varies in accordance as with a sine curve, owing to the fact that the square

root of the mean square value is 11 per cent. greater than the average value.

The formula for self-induced voltage is:

$$\frac{4.44 \times N \times n \times f}{10^8}$$ in which

N = total number of turns in the coil.

n = total number of lines through the coil.

f = frequency in cycles per second.

This is also the formula for the production of alternating current voltage, no matter in what form of device.

From Fig. 11 it may be seen that if the length of the horizontal line A B, represents to some chosen scale the voltage required to overcome the resistance ($= R\ I$), and the length of B C represents the self-induced voltage of the inductance, the values being the effective or square root of the mean square, the dynamo or loop voltage, E represented by the line AC is equal to

$$\sqrt{(AB)^2+(BC)^2} = \sqrt{(RI)^2+(6.28fL)^2}$$

or $E = I(\sqrt{R^2+(6.28fL)^2})$

Also $I = \dfrac{E}{\sqrt{R^2+(6.28fL)^2}}$

L = inductance in henrys.

f = frequency in cycles per second.

Action of Condenser.—If the brushes of a rotating loop such as is shown in Fig. 2 be connected to the terminals of a condenser (see CONDENSER and ELECTRICITY, PRINCIPLES OF); an alternating pressure will be communicated from the loop to the condenser plates. As the voltage of the loop rises it charges the condenser more and more, this charge being effected by current flowing from the loop to the condenser plates. When the loop voltage reaches its maximum and stops increasing, no more current can be sent by the loop into the condenser as the rise in condenser voltage is always equal and counter to that of the loops, when there is no resistance in the circuit and, therefore, when the loop *voltage* is a maximum, the condenser *current* is zero. Also when the loop voltage begins to decrease the condenser begins to discharge, sending out current in a direction opposite to that in which it flowed when being charged. As the loop passes through zero and its electrical pressure begins to reverse, the discharge of the condenser is most rapid. Hence the condenser *current* is a *maximum* when the impressed *voltage* is *zero*. Conversely the condenser *potential is zero* at the time of *maximum current* flow and is a *maximum* at the time of *zero current* flow.

If the curve of current i i i i be plotted as in Fig. 10 the curve of condenser potential will be indicated by the curve c c c c which is a maximum at the zero points of i i i i, and zero when i i i i, is a maximum.

The current curve is in phase with the curve of the *resultant* pressure eeee. Combining the *resultant pressure* curve e e e e with the condenser pressure curve by

subtracting the condenser voltage from the resultant voltage, algebraically, the curve v v v v v is the pressure the rotating loop must produce in order to pass the current i i i i through the resistance of the circuit and overcome the counter pressure of the condenser.

As may be seen, the current is *ahead of the impressed pressure*, i.e., it reaches the maximum before the voltage of the loop reaches its maximum. This is the opposite of the condition when inductance is in the circuit, and the current is, in this case, said to *lead*. Also the condenser pressure is at 90 degrees to and anead of the current.

Just as in the case of the inductance, it is convenient to compute the impressed pressure by a right triangle

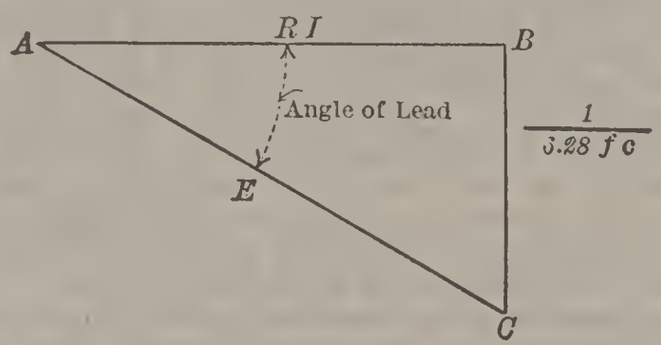


Fig. 11.

diagram. Thus in Fig. 11, if A B = the resistance, and B C = the condenser voltage—plotted *downward* in this case—A C is the necessary impressed voltage, *per ampere* passed through the circuit. Obviously $E = \sqrt{(R^2+Z^2)} \times I$ in which R = resistance and Z the condenser voltage or *condensance*. From this,

$$I = \frac{E}{\sqrt{R^2+Z^2}}$$

Mathematically, $Z = \frac{1{,}000{,}000}{6.28 \times f \times C}$ where f = frequency and C = capacity of condenser in *micro-farads*.

Combined Condensance and Inductance.—Since condensance and inductance are in opposition to each other at every instant in a cycle they may be made to neutralize each other by making the condenser voltage equal to the inductance voltage. This condition is attained when $6.28 \times f \times L = \frac{1{,}000{,}000}{6.28 \times f \times C}$ and is called *resonance*.

In all cases the effects of condensance and inductance tend to neutralize so that the complete formula for current flow through a circuit containing a condenser and an inductance connected in series, is

$$I = \frac{E}{\sqrt{+R^2\left(6.28 \times fL - \frac{1{,}000{,}000}{6.28 \times f \times C}\right)^2}}$$

The denominator shows all the effects which oppose current flow and is called the *impedence*.

The power delivered from any source of current is equal to the volts multiplied by the amperes. In the case of alternating currents, no commercial instruments can follow the rapid fluctuations of current and voltage and no eye could follow a needle to compare it with a scale, even if such an instrument were available.

Therefore alternating current instruments are made to hold their needles in given positions for given values of current and voltage, and thus register the square root of the mean square values. They, however, give no indication of the *phase relation* between the current and voltage. When these are in phase, the product of *volts* × *amperes* as indicated by the instruments gives the *watts*. But when there is an angle of lag or lead this is not true, for the watts at any instant = volts × amperes and for pressures and current *out of phase* there are instants when the current is considerable but the pressure zero and conversely the pressure great but the current zero. Consequently to find the true watts from instrument readings it is necessary to take into consideration the lag or lead. The product of *volts* × *amperes* × *Cos* ϕ is the true value in which ϕ is the angle of lag or lead. Cos ϕ is called the *power factor*, as it shows the relation between the *apparent watts* and the *true watts*. When there is no inductance in the circuit the angle ϕ is zero, its cosine is therefore =1 and the watts are equal to volts x amperes; cos ϕ cancelling out.

ELECTROLYSIS: the removal of metal by the electric current from an electrode in a liquid or surrounded by moist substances.

ELECTROLYTE: any liquid which is a good conductor of electricity.

ELECTRO-MAGNET. See MAGNETISM.

ELECTROMETER. See ELECTRIC MEASURING INSTRUMENTS.

ELECTRO-MOTIVE FORCE: the same as voltage or electrical pressure.

ELECTRO-NEGATIVE AND ELECTRO-POSITIVE: in chemistry these terms were introduced by Berzelius, about a century ago. They are based on the fact that elements of *dissimilar* properties combine the most readily and yield compounds of greatest stability. Further, chemical and electrical phenomena are closely connected, although the nature of the connection is not known. Berzelius believed that every compound must consist of two electrically dissimilar parts (positive and negative). This theory can no longer be sustained, especially in the case of organic compounds. At present the term E. negative is applied to such elements or groups (radicals) as are attracted, during electrolysis, to the positive pole (cathode), for example Cl, Br, O, So_4, etc. In general, these are all acid-forming substances. Elements or groups which migrate to the negative pole (anode), such as H Na, N H_4, etc., are, in general, metals or they give

rise to basic substances and they are termed electro-positive. See *Electro-Statics* in ELECTRICITY, PRINCIPLES OF.

ELECTROPHORUS. See *Electro-Statics in* ELECTRICITY, PRINCIPLES OF.

ELECTRO-POSITIVE. See *Electro-Statics* in ELECTRICITY, PRINCIPLES OF.

ELECTRO-STATIC. See ELECTRICITY, PRINCIPLES OF.

ELECTROTONUS, n. *ē'lĕk-trŏt'ŏ-nŭs* [Gr. *elektron*, amber; *tonos*, tone]: a physiological phenomenon observed in muscles and nerves on the passage of an electric current. ELEC'TROTON'IC, a. *-tŏn'ĭk*, of or pertaining to.

ELECTUARY, n. *ĕ-lĕk'tū-ĕr-ĭ* [F. *électuaire*—from mid. L. *electŭārĭŭm*—from Gr. *ek*, out of; *leichō*, I lick]: medicinal preparation in which the remedy is enveloped or suspended in honey or syrup, to make a mixture of thick semi-fluid consistence.

ELEEMOSYNARY, a. *ĕl'ĕ-mŏz'ĭ-nĕr-ĭ* [Gr. *ĕlĕēmŏsŭnē*, pity, alms]: relating to charity; given in charity; intended for charitable purposes: N. one living on charity.

ELEGANCE, n. *ĕl'ĕ-gănsˊ*—rarely EL'EGANCY, n. *-găn-sĭ* [F. *élégance*—from L. *elĕganĭă*, neatness, refinement—from *ex*, out; *lego*, I choose: It. *eleganza*]: polish of manners; propriety; gracefulness; refinement; neatness; beauty or symmetry, applied to writings, speech, buildings, or dress, that which pleases. EL'EGANCIES, plu. *-sĭz*, graces or refinements. EL'EGANT, a. *-gănt* [F.—L.]: graceful; refined; beautiful; symmetrical; pleasing to good taste; correct. EL'EGANTLY, ad. *-lĭ*.—SYN. of 'elegant': comely; polished; handsome; nice.

ELEGY, n. *ĕl'ĕ-jĭ* [OF. *elegie*, an elegy—from L. *elegia;* Gr. *elegeia*, an elegy: It. *elegia*]: a song expressing sorrow; a funeral song. ELEGIAC, a. *ĕl'ĕ-jī'ăk*, plaintive; expressing sorrow; also EL'EGI'ACAL, a. *-jī'ă-kăl*. ELEGIST, n. *ĕl'ĕ-jĭst*, one who writes elegy.—*Elegy*, according to its derivation, signifies, exclusively, a song of lamentation, but the term was employed at an early period by the Greeks to designate any poem written in distiches. The alternation peculiar to this measure, of the hexameter, or strictly narrative verse, with the more fiery pentameter, gives to this whole species of poetry its individual character, which consists in the connection of subjective feelings and emotions with external incidents or objects. The elegy, therefore, can often be chiefly, but never altogether narrative. The effect of the measure is further shown in the fact that earnest, long-sustained feelings, rarely violent passions, are expressed in the elegy. Of the numerous elegies of the Greeks, few have come down to us. Those extant consist partly of encouragements to patriotism, as in Callinus and Tyrtæus, and partly of lessons of practical wisdom, as in Solon and Theognis.

Among the Romans, Catullus was the first good elegiac writer; after him came Propertius, Tibullus, and Ovid. Tibullus, in particular, brought the erotic elegy to its highest perfection. All are marked by the absence of political or moral feeling. They lived at a time, the Augustan age, when it was dangerous to express the one, and unfashionable to express the other. In modern times, the term elegy is applied to any serious piece where a tone of melancholy pervades the sentiments, whether grief is actually expressed or not; e.g., 'Gray's *Elegy*, written in a country churchyard.'

ELEMENT, n. *ĕl'ĕ-mĕnt* [F. *élément*—from L. *elĕmen'tum*, an element; plu. *elĕmen'ta*, the first elements of things; It. *elemento*]: a simple substance; the first or constituent principle of anything; an ingredient or constituent part; the proper sphere or state of anything. EL'EMENTS, n. plu. the first rules or principles of any branch of knowledge; rudiments; data; an outline or sketch; the bread and wine used in the Eucharist or Lord's Supper. EL'EMEN'TAL, a. *-mĕn'tăl*, produced by elements; arising from first principles. EL'EMEN'TALLY, ad. *-lĭ*. EL'EMENTAL'ITY, n. *-ĭ-tĭ*, composition; combination of ingredients. EL'EMEN'TARY, a. *tĕr-ĭ*, simple; relating to first principles; rudimentary; uncombined; uncompounded; primary. OUT OF ONE'S ELEMENT, in *familiar language*, out of one's proper habitation or sphere; dealing with unfamiliar matters. THE ELEMENTS, in *popular language*, fire, air, earth, and water. THE ELEMENTARY SPIRITS, beings who, according to the popular belief of the middle ages, presided over the four 'elements,' living in and ruling them. The elemental spirits of fire were called Salamanders; those of water, Undines; those of the air, Sylphs; and those of the earth, Gnomes. These imaginary beings play a part in Pope's mock-heroic poem, *The Rape of the Lock*. ELEMENTS, in *astronomy*, those numerical quantities and those principles deduced from astronomical observations and calculations, which are employed in the construction of tables exhibiting the planetary motions. They include the greatest, least, and mean distances of the planets from the sun, the eccentricities of their orbits, their mean motions, daily and annual, with the motions of their aphelia, and the inclinations of their orbits to the ecliptic; their masses and densities, etc. For the elements of the different planets and of their satellites see their names. For tables of the elements of all bodies in the solar system see the books on astronomy; in particular Herschel's *Elements of Astronomy*. ELEMENTARY SUBSTANCE, or CHEMICAL ELEMENT—in *chemistry*, a substance which cannot be decomposed into simpler, dissimilar bodies. Much speculation has been indulged in regarding the decomposibility of the present elements and their possible conversion into each other. The above definition will, of course, hold if all the present elements were to be decomposed tomorrow. We know nothing of the real nature of the elements, or of

any substances except that some can and some cannot be decomposed. In the past, substances at first believed to be elementary were subsequently shown to be compound, doubtless this will occur in the future. The decomposition of radium into a number of products, of which helium is one, has been cited in popular journals as an instance of 'decomposition of an element.' The essential point of difference between this and an ordinary chemical reaction is found in the fact that we can regulate or start the latter, whereas the former is entirely beyond control. It takes place at the same rate absolutely irrespective of any conditions of temperature, etc., to which the radium may be subjected. Many speculations have been indulged in regarding the nature of the element and of the possibility of converting one of them into another, usually, of course, a cheap metal into gold. In spite of innumerable attempts, this has never yet been accomplished, although many silly people have lost money in schemes of this nature, propounded by quacks whose ignorance of chemistry is only equalled by the foolishness of their dupes. Theoretical speculations regarding the nature of the element have also been largely indulged in. It is fascinating to a certain type of mind, but is a useless waste of time unless its conclusions are tested by laboratory experiments. As a rule, this is the very last thing the theorizer or 'crank' ever thinks of doing. At present about 77 elements are recognized. They are divided into the metals and nonmetals (q.v.), though the separation is a purely relative one made for convenience. Logically, the distinction is, in many instances, impossible. Other smaller groups are also distinguished, such as the Earths, Alkalies, Alkaline Earths, etc. (q.v.). A table of elements is given under Chemistry (q.v.). See also Atomic Theory, Periodic Law, etc. The following is the list of substances generally admitted to be elements, with their chemical symbols:

Aluminum	Al	Helium	He
Antimony	Sb	Hydrogen	H
Argon	A	Indium	In
Arsenic	As	Iodine	I
Barium	Ba	Iridium	Ir
Bismuth	Bi	Iron	Fe
Boron	B	Krypton	Kr
Bromine	Br	Lanthanum	La
Cadmium	Cd	Lead	Pb
Cæsium	Cs	Lithium	Li
Calcium	Ca	Magnesium	Mg
Carbon	C	Manganese	Mn
Cerium	Ce	Mercury	Hg
Chlornie	Cl	Molybdenum	Mo
Chromium	Cr	Neodymium	Nd
Cobalt	Co	Neon	Ne
Columbium	Cb	Nickel	Ni
Copper	Cu	Nitrogen	N
Erbium	E	Osmium	Os
Fluorine	F	Oxygen	O
Gadloinium	Gd	Palladium	Pd
Gallium	Ga	Phosphorus	P
Germanium	Ge	Platinum	Pt
Glucinum	Gl	Potassium	K
Gold	Au	Praseodymium	Pr

Radium	Ra	Tium	Tı
Rhodium	Rh	Thallium	Tl
Rubidium	Rb	Thoriu	Th
Ruthenium	Ru	Thulinum	Tu
Samarium	Sa	Tin	Sn
Scandium	Sc	Titanium	Ti
Selenium	Se	Tungsten	W
Silicon	Si	Uranium	U
Silver	Ag	Vanadium	V
Sodium	Na	Xenon	X
Strontium	Sr	Ytterbium	Yt
Sulphur	S	Yttrium	Y
Tantalum	Ta	Zinc	Zn
Trellurium	Te	Zirconium	Zr

ELEMENTARY EDUCATION: see EDUCATION IN THE UNITED STATES.

ELEMI, n. *ĕl′ĕ-mĭ* [F., It., and Sp. *elemi*—probably of oriental origin]: a fragrant resinous extract obtained chiefly from trees of the order *Burseraceæ*. The hard elemi, most abundant in the West Indies, is obtained from species of *Bursera*, and is either yellowish or greenish, sometimes opaque and sometimes translucent, has a fatty lustre, is easily pulverized, and very fusible. It is heavier than water, in which it is insoluble, although it is readily dissolved in either turpentine or alcohol. African elemi is an extract of *Boswellia freereana* or *Santiriopsis balsamifera;* Manila elemi a product of *Canarium commune;* and the Mauritius variety is obtained from *Canarium paniculatum*. A large part of the elemi of commerce is produced from trees of different genera of the same family growing in tropical America. Elemi is a regular constituent of spirit varnishes, and the Manila kind is used in plasters and ointments. In Eastern countries it is also used as incense. Its active principle is a volatile oil obtained by distillation. EL′EMINE, n. *-mĭn*, the crystallized and purified resin of elemi; light, inodorous, and tasteless; used to give consistency to the varnish which forms part of the composition of lacquer.

ELENCHUS, n. *ē-lĕngk′ŭs*, or ELENCH, n. *ē-lĕngk′* [Gr. *elengchos*, proof, demonstration]: in *log.*, a vicious or fallacious argument; a sophism; a syllogism which convinces or confutes an antagonist. ELENCHIAL, a. *ĕ-lĕng′-kĭ-ăl*, pertaining to.

ELEOCHARIS, n. *ĕl-ē-ŏk′ĕr-ĭs* [Gr. *heleos*, a marsh; *chairō*, I rejoice]: spike-rush, genus of *Cyperaceæ*, tribe *Scirpeæ*. About 118 species are known. The Creeping Spike-rush (*Eleocharis palustris*), is the most common, found in Britain, on the continent of Europe, in n. Africa, n. Asia, western India, and in N. America.

ELEOTRAGUS, n. *ĕl-ĕ-ō-trā′gŭs* [Gr. *heleos*, a marsh; *tragos*, a he-goat]: genus of antelopes. *E. arundinaceus* is the Riet-Boc (Reed-buck) of s. Africa.

ELEPHANT, n. *ĕl′ĕ-fănt* [F. *éléphant;* OF. *olifant*—from L. *elephantem*, an elephant: It. *elephante*]: the name of a well-known animal. EL′EPHAN′TINE, a. *-făn′tĭn*, pertaining to; very large. EL′EPHANTI′ASIS, n. *-tī′ă-sĭs*, a disease of the skin by which it becomes thick, livid, and

insensible to feeling: *Elephantiasis of the Greeks*, see LEPROSY: *Elephantiasis of the Arabs*, see BARBADOES LEG. EL′EPHAN′TOID, a. *-toyd*, or EL′EPHANTOI′DAL, a. *-toy′dăl* [Gr. *eidos*, resemblance]: shaped like an elephant. ELEPHANT'S-FOOT, or tortoise-plant, so called from its peculiar shortened and thickened stem; the *Testūdinārĭă elephan′-tĭpēs*, ord. *Dioscorĕācĕæ*.

EL′EPHANT (Gr. *Elephas*): genus of quadrupeds, of the order *Pachydermata* (q.v.), section *Proboscidea*. Elephants are the largest existing land animals. The ordinary height at the shoulder is about eight ft., but sometimes exceeds 10 ft. The weight of a large elephant is about five tons, the body being very bulky in proportion to its height. To sustain this weight, it is furnished with limbs of colossal thickness and strength, which are also remarkably straight, each bone resting vertically on that beneath it. From the appearance of inflexibility presented by the limbs, arose the notion prevalent among the ancients, and in the middles ages, that the limbs are destitute of joints, and that consequently an elephant cannot lie down to rest like another quadruped, and if it were to lie down, could not rise again, but always sleeps standing, or leaning against a tree. It is indeed true that the elephant often sleeps standing, and when fatigued, falls asleep leaning against a rock or tree, against which it may have been rubbing itself. The flexibility of the limbs is, however, sufficient to permit elephants to run with speed nearly equal to that of a horse, to indulge in playful gambols, and to ascend and descend steep mountains. Elephants are more sure-footed and serviceable than either horses or mules, in difficult mountain roads. On the very steepest declivities, an elephant works his way down somewhat rapidly, even with a *howdah* and its occupants upon his back, his chest and belly on the ground, and each fore-foot employed in making a hole for itself, into which the hind foot follows it, and to which the weight may be trusted, that another step may be ventured with safety. In lying down, the elephant does not bring his hind-legs under him, like the horse and other quadrupeds, but extends them backward (as man does when he assumes the kneeling position), an arrangement which, 'by enabling him to draw the hind-feet gradually under him, assists him to rise almost without a perceptible effort.' The elephant's pace, when exceeding a walk, is neither a trot nor a gallop, which would be too violent a motion for its conformation and huge body, but a sort of shuffle, the speed of which is increased or diminished without alteration. The elephant is incapable of springing like the deer, horse, and other animals.

The head in elephants is large; the neck is short and thick, the long flexible proboscis compensating both for the shortness of the neck, and for the inflexibility caused by the largely developed processes of its vertebræ, and enabling

the animal readily to reach objects on the ground, or to a height of several feet above its head, or on either side. A great extent of bony surface in the head affords attachment for muscles destined to move and give power to the proboscis or trunk. This extent of bony surface is provided in a remarkable manner, which at the same time makes the head, heavy as it is, lighter in proportion to its bulk than is usual in quadrupeds; a great space separating the internal and external tables of all the bones of the skull, except the occipital bones, so that the space occupied by the brain is but a small part of the whole head. The space between the tables of the bones is occupied by cells, some of which are four or five inches in length; others are small, irregular, and honeycomb-like; 'these all communicate with each other, and through the frontal sinuses with the cavity of the nose, and also with the tympanum or drum of each ear; consequently, as in some birds, these cells are filled with air.' The huge and extraordinary bones of the skull, be-

Various positions of the Elephant's Trunk:

1, female elephant suckling her young one; 2, the young one; 3, elephant reposing; 4, elephant swimming; 5, young elephant browsing.

sides affording attachment for muscles, afford mechanical support to the tusks.

The nasal bones of the E. are scarcely more than rudimentary; but the tapering proboscis, to the very extremity of which the nostrils are prolonged, is nearly eight ft. in length. Besides the great muscles connected with it at its base, it is composed of a vast multitude of small muscles variously interlaced, but chiefly either longitudinal, and divided into successive arcs, of which the convexity is outward, or transverse, and radiating from the internal to the external membrane. Cuvier states the number of muscles having the power of distinct action as not far short of 40,000. The trunk can be coiled around a tree, and employed to tear it from its roots: it is a formidable weapon of offense or defense, and is far more employed in this way than the

tusks, even by those elephants which have tusks of great size; its extremity can be wound around a small handful of grass or a slender branch; it is even capable of plucking the smallest leaf, or of lifting a pin from the ground. To fit it for such actions as those last mentioned, and for many such as might be performed by a hand, it is furnished at the extremity with what may be likened to a finger and thumb; on the upper side, an elongated process—strong, soft, and flexible, like the rest of the trunk, and endowed with the most delicate sense of touch—on the under side, a kind of tubercle against which this process may be pressed. All the food of the E is gathered and conveyed to the mouth by the trunk: by means of the trunk, also, it drinks,

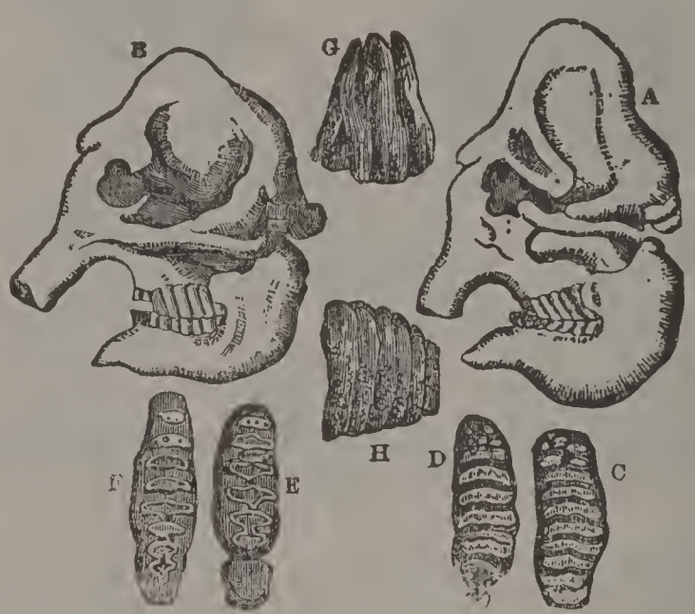
1, elephant drinking; 2, elephant gathering long herbage, 3, elephant spouting water over its back.

sucking up into it a quantity of water sufficient to fill it, and then discharging the contents into the mouth. Valves at the base of the trunk prevent the water from going too far up the nostrils. The trunk is constantly employed by elephants in providing in many ways for their comfort or enjoyment, as in throwing dust over their backs, or in fanning themselves and switching away flies with a leafy branch, two practices to which they are addicted. Their mutual caresses also are managed by means of the trunk, and through it they make a loud shrill sound, indicative of rage, described by Aristotle as resembling the hoarse sound of a trumpet, and from which this organ received its French name *trompe*, corrupted in English into trunk. With the trunk also, they sometimes, when angry, beat violently on the ground.

The sense of smell is very acute in the E., as is also that of hearing. The ears are large and pendulous, the eyes are small.

Elephants have no canine teeth, nor have they any incisors in the lower jaw. The upper jaw is furnished with

two incisors, which assume the peculiar character of tusks, and attain an enormous size, a single tusk sometimes weighing 150 or even 300 lbs. The tusks are, however, often imperfectly developed, ten or twelve inches in length, and one or two in diameter. These stunted tusks are often used for such purposes as snapping off small branches and tearing climbing plants from trees. Those elephants which have great tusks employ them also for such other uses as loosening the roots of trees which they cannot otherwise tear from the ground; or in a state of domestication, for such labors as moving great stones, and piling or carrying timber. A powerful E. will raise and carry on his tusks a log of half a ton weight or more. The tusks of the E surpass in size all other teeth of existing animals, and are the largest of all teeth in proportion to the size of the body. They consist chiefly of that variety of *dentine* called IVORY (q.v.), and continue to grow—like the incisors of the rodents, to which they are in some respects analogous—even when the animal has attained a great age, if not to the



A, skull of Indian elephant; B, skull of African elephant; C. D, upper and lower molar teeth of Indian elephant; E, F. upper and lower molar teeth of African elephant; G, the original state of the grinders when the laminæ of which they consist are as yet unconnected together; H. the laminæ as they are attached in parallels one to the other by cortical substance.

very end of its life. The young E. is at first furnished with deciduous incisors, which are shed between the first and second year, and are succeeded by the permanent tusks.—The molar teeth of the E. are developed in succession; and at least in the Indian E., never more than two are seen in the same side of a jaw at one time. The first molars cut the gum in about two weeks after birth, and are shed about the end of the second year. The sixth molars, believed to be the last, are supposed to appear about the 50th year of the E.'s life. The molar teeth of the E. are remarkable for their great size, and for extreme complexity of structure,

to which the nearest resemblance is found in some of the small rodents. They are composed of vertical plates of bony substance, separately enveloped with enamel, and cemented together by a third substance, called *crusta petrosa*, *cortical*, or *cement*, resembling bone rather than enamel. Each succeeding tooth is not only more complex, but occupies a greater space in the jaw than its predecessor. Although formed from a single pulp, the molar tooth of an E. resembles an aggregation of teeth; and in the earlier stages of its growth, when the cement is not yet deposited, it seems as if many separate teeth were soldered together. As the surface of the tooth is worn down by mastication, the harder enamel is exposed in elevated ridges. The whole of a tooth is not in employment at once. From the peculiar manner of its growth, the anterior part begins to be used and to be worn away, while the latter part is still in process of formation.

The digestive apparatus of the E. is similar to that of the other pachydermata; but the stomach, which is of a very lengthened and narrow form, exhibits a peculiarity which assimilates it to that of the camel; the internal membrane, at the extremity beyond the cardiac orifice, forming thick wrinkles and folds, the broadest of which, and nearest to the gullet, seems to act as a valve, making that end of the stomach a reservoir for water, capable of containing about ten gallons; while a peculiar muscle, connecting the windpipe and gullet, enables the animal to open this reservoir at pleasure, for the regurgitation of the fluid, which is then sometimes received into the trunk, and squirted over the body, to free it from the nuisance of flies, or the heat of a tropical sun.

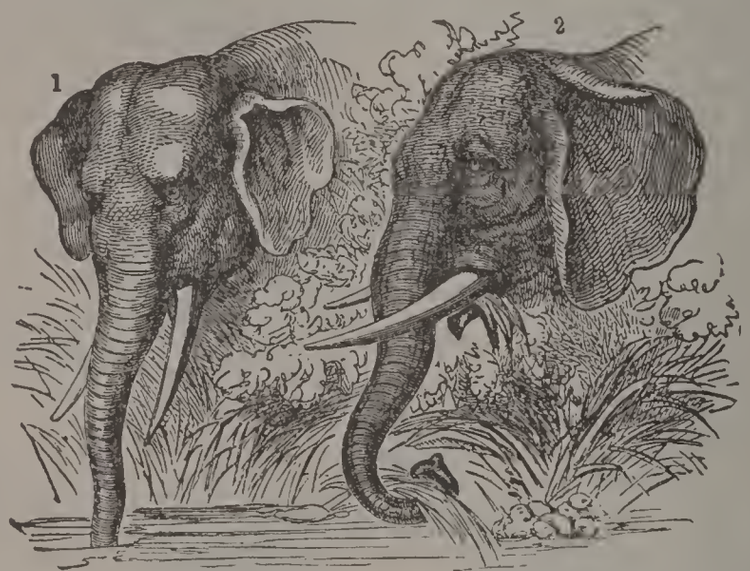
The female E. has only two teats, between the fore-legs. The young suck with the mouth, and not with the trunk. They are suckled for about two years. The period of gestation also is nearly two years, and a single young one is produced at a birth.

The skin of the E. is very thick, of a dark-brown color, and in the existing species, has scarcely any covering of hair. The tail does not reach to the ground, and has a tuft of coarse bristles at the end. The feet have in the skeleton five distinct toes, but these are so surrounded with a firm horny skin, that only the nails are visible externally, as on the margin of a kind of hoof. The foot of the E. is admirably adapted for steep and rough ground, the protective skin which covers the toes allowing them considerable freedom of motion.

Only two existing species of E. are certainly known, the Indian (*E. Indicus*) and the African (*E. Africanus*), though differences have recently been observed in the E. of Sumatra, which may perhaps entitle it to be ranked as a distinct species. Elephants are found in all parts of Africa, from the Sahara southward, where wood and water are sufficient; also throughout India and s.e. Asia, and in some of the tropical Asiatic islands. They extend northward to the Himalaya; and Chittagong and Tiperah vie with Ceylon in the superior excellence of the elephants which they produce. The Indian E. is distinguished by a comparatively

high oblong head, with a concave forehead; while the African has a round head and convex forehead. The ears of the African E. are much larger than those of the Indian, covering the whole shoulder, and descending on the legs. A marked distinction of the two species is found also in the molar teeth; those of the Indian E. exhibiting *wavy parallel transverse ridges;* while those of the African species have the divisions of the crown of the tooth fewer, broader, and *lozenge-shaped.*

Elephants live in herds, not generally numerous, though several herds often congregate together in the same forest or at the same place of drinking. Each herd has a leader, generally the largest and most powerful animal. The leader seems to exercise much control over the movements of the herd, gives the alarm in case of danger, and seems to examine and decide for the whole herd as to the safety



1, Head of Asiatic Elephant; 2, Head of African Elephant

of proceeding in any particular direction. On account of his tusks, the leader is often the animal against which the efforts of the hunter are directed; but the rest of the herd do their utmost to protect him, and when driven to extremity, they place him in the centre, and crowd so eagerly to the front of him that some of them must often be shot ere he can be reached. A family resemblance is usually readily visible among the elephants of the same herd; some herds are distinguished by greater stature, and others by more bulky form and stronger limbs; some by particularly large tusks, some by slight peculiarities of the trunk, etc. In the E. Indies, distinctions of this kind have long been carefully noticed, and particular names are given to elephants according to them, some being considered as *high caste,* and others as *low-caste* elephants. An E. which by any cause has been separated from its herd, seems never to be admitted into another, and these solitary elephants are particularly troublesome, in their depredations exhibiting an audacity which the herds never exhibit; they are also

savage and much dreaded, while from a herd of elephants danger is scarcely apprehended. The E. is generally one of the most inoffensive of animals, though in a state of domestication, it shows, as is well known, a power both of remembering and resenting an injury.

The favorite haunts of wild elephants are in the depths of forests—particularly in mountainous regions—where they browse on branches, and whence they issue chiefly in the cool of the night to pasture in the more open grounds. They are ready to plunder rice or other grain-fields, if not deterred by fences, of which, fortunately, they have, in general, an unaccountable dread. A fence scarcely more than imaginary, of mere reeds, will keep them out of fields, where, as soon as the grain is removed, they enter by the gaps of the fence, and may be seen gleaning among the stubble.

When the E. eats grass, 'nothing can be more graceful than the ease with which, before conveying it to his mouth, he beats the earth from its roots by striking it on his fore-leg.' A cocoa-nut is first rolled under foot, to detach the outer bark, then stripped of the fibrous husk, and finally crushed between the grinders, when the fresh milk is swallowed with evident relish. The fruit of the palmyra palm is another favorite food of elephants, and they seem to have an instinctive knowledge of the time of its ripening. Sugar-canes also are favorite food; indeed, elephants are very fond of sweet things. Those which are brought to Europe or America are generally fed on hay and carrots. The weight of daily food necessary for the E. in a state of domestication may be stated, on an average, at about 200 lbs

Elephants delight in abundance of water, and enter it very freely, often remaining in it for a considerable time and with great evident enjoyment. They sometimes swim with not only the body but the head under water, the only part elevated above it being the extremity of the trunk.

The habits of African E. appear in no important respect to differ from those of the Indian elephant. It is the latter only that is at the present day domesticated; but it is certain that the African species was anciently domesticated, and the figures on many Roman medals attest it.

Elephants rarely breed in domestication, though, a few years ago, the birth of an elephant took place in the Zoological Gardens of London. They are generally tamed within a few months after capture; some degree of severity being employed at first, which, however, as soon as the animal has begun to respect the power of man, is exchanged for gentleness of treatment. Elephants intended for domestication are captured in various ways. It was formerly common to take them in pitfalls, but in this way they were often much injured. Another method frequently practised is by the aid of tame elephants. Male elephants chiefly are captured in this way, the decoy elephants employed being females, trained for the purpose. With these the hunters very cautiously approach the animal they mean to capture, and he generally permits them to come up to him,

and is so pleased to make the acquaintance of the females, that he takes no notice of their riders and other human attendants. Two of the females take their places, one on each side of him, and while he is occupied with them, men, the profession of whose lives it is, and who have wonderful expertness in the work, contrive to get beneath their bodies, and to pass ropes round the legs of the intended captive. His two hind-legs are fastened together by six or eight ropes in the form of the figure 8, another rope keeping them tight at the intersections, and a strong cable with a running-noose is attached to each hind-leg. About 20 minutes usually are spent in fixing the necessary ropes, profound silence being maintained if the process goes on unobserved, or some of the other hunters distracting the attention of the E. from those who are engaged in this work; and when at last, becoming sensible of his danger, he tries to retreat, an opportunity is soon found of tying him, by means of the long cables which trail behind him, to some tree strong enough for the purpose. His fury then becomes ungovernable, and he makes violent and prodigious efforts to get free, throwing himself on the ground, and twisting himself into the most extraordinary positions. It is not until he has thoroughly exhausted himself, and begins to suffer severely from fatigue, thirst, and hunger, that the next steps are taken toward taming him and making him a willing servant of man.

Still more wonderful is the capture of a wild E., sometimes by not more than two hunters, who for this purpose will go into the woods, without aid or attendants, their only weapon a flexible rope of hide. With this they secure one of the E.'s hind legs, following his footsteps when in motion, or stealing close up to him when at rest, or sometimes spreading the noose on the ground, partially concealed by roots and leaves, beneath a tree on which one of the party is stationed, whose business it is to lift it suddenly by means of a cord. When arrested by the rope being coiled around a tree, the E. naturally turns upon the man who is engaged in making it fast, but his companion interferes on his behalf, by provoking the animal; and thus not only is the first rope made fast, but noose after noose is passed over the legs, until all are at last tied to trees, and the capture is complete; upon which the hunters build a booth for themselves in front of their prisoner, kindle their fires for cooking, and remain day and night till the E. is sufficiently tamed to be led away.

But these huge animals are not always captured singly; whole herds are often taken at once. This is accomplished by means of an inclosure; toward which the elephants are driven by great numbers of men encircling a considerable space and contracting the circle by slow degrees. Weeks, or even months, are spent in this operation, and at last the elephants, hemmed in on every side except the mouth of the inclosure, enter it, and the gate is immediately closed. The modes of constructing the inclosure differ in different countries. Tame elephants are sometimes sent into it, and the captives are in succession made

fast to trees there, in a way somewhat similar to that practised in capturing single elephants.

The E. became known in Europe first from its employment in the wars of the East: 'In India, from the remotest antiquity, it formed one of the most picturesque, if not of the most effective, features in the armies of the native princes.' Elephants have been taught to cut and thrust with a kind of scimiter carried in the trunk, and it was formerly usual for them to be sent into battle, covered with armor, and bearing towers on their backs which, contained warriors. But the principal use of the E. in war is for carrying baggage, and for dragging guns. An E. will apply his forehead to a cannon, and urge it through a bog, through which it would be almost impossible for men and cattle to drag it; or he will wind his trunk round it, and lift it up, while horses or cattle drag it forward. Elephants are used in the East for carrying persons on their backs, a number being seated together in a *howdah*, while the driver (*mahout*) sits on the E.'s neck, directing it by his voice and by a small goad. Elephants have always a conspicuous place in the great processions and state displays of eastern princes; and white elephants—albinos—are peculiarly valued. Elephants are employed also in many kinds of labor, and show great sagacity in comprehending the nature of their task and adapting themselves to it. In piling timber, the E. 'manifests an intelligence and dexterity which is surprising to a stranger, because the sameness of the operation enables the animal to go on for hours disposing of log after log, almost without a hint or direction from his attendant.'

Of the sagacity of the E., many interesting anecdotes are on record. But Cuvier refuses, apparently with justice, to ascribe to it a degree of sagacity higher than that of the dog. In domestication, the E. is a delicate animal, requiring much watchfulness and care. though naturally it has a very long life, and instances are on record of extreme longevity in domestication, extending not only to more than 100, but almost to 200 years.

The numbers of wild elephants in some parts both of the E. Indies and of Africa, are being gradually reduced as cultivation extends, and many are shot for no other reason than a desire to reduce their numbers, and put an end to their ravages on cultivated grounds. A reward of a few shillings per head was claimed for 3,500 destroyed in part of the n. province alone of Ceylon, in less than three years prior to 1848. It is for the sake of ivory that the greatest slaughter of elephants takes place. A ball of hard metal, skilfully planted in the eye, base of the trunk, or behind the ear, generally ends an E.'s life in an instant; and expert *sportsmen* have been known to kill right and left one with each barrel.

Fossil Elephants.—The E. makes its appearance in the Pleistocene strata. Its near ally, the mastodon, whose remains are found associated with it, began life earlier; it has left its traces in Miocene deposits. Ten species of fossil elephants have been described, the remains of three

of which are found in Europe. The best known of these is the *Elephas primigenius*, or mammoth, the tusks of which are so little altered as to supply an ivory which, though inferior to that of the living species, is still used in the arts, especially in Russia. Its tusks are regularly searched for by 'ivory hunters' in Siberia, where, in the superficial deposits of sand, gravel, and loam, the remains occur in enormous abundance. They are found also in similar strata all over Europe. In Britain, the localities that have supplied these remains are very numerous, and are especially abundant in the Pleistocene deposits of the e. and s.e. of England. Woodward, in his *Geology of Norfolk*, calculates that upward of 2,000 grinders of this animal had been dredged up by the fishermen off Happisburgh in 13 years. The bone-caves also yield remains of this gigantic animal.

The mammoth truly belongs to the geological history of the world; it died out at the close of the period represented

Skeleton of Mammoth.

by the beds of the Quaternary (q.v.), or Pleistocene of Lyell. The Mammoth of N. Amer. has been separated as *E. Americanus*, but teeth intermediate between it, as described, and *E. primigenius* were found in Grinnell, Io.; probably these are one species. It was as large, with similarly curved tusks, as the Siberian specimen, which was found preserved in ice so that its flesh was eaten by dogs, bears, and wolves. In 1799, a Tungusian, named Schumachoff, searching the shores of Lake Oncoul for mammoth tusks, observed among the blocks of ice a shapeless mass, but did not at the time discover what it was. The heat of succeeding summers gradually melted the ice around it, and in 1803 the mammoth fell on a bank of sand. In March of the following year, the hunter visited it, cut off, and carried away the tusks, which he sold for fifty rubles. In 1806, Mr. Adams visited the locality, and examined the animal, which still remained on the sand-bank where it had fallen, but greatly mutilated. The Jakutski of the neighborhood had cut off the flesh to feed their dogs,

and the wild beasts had almost entirely cleared the bones. The skeleton was, however, entire, except one of the fore-legs, and some of the bones of the tail. Many of the bones were still held together by the ligaments and by parts of the skin. The head was covered with dry skin; one of the ears was well preserved; it was furnished with a tuft of hairs. Three-fourths of the whole skin were procured, which was so heavy that ten persons found great difficulty in transporting it 150 feet to the shore; it was of dark-gray color, and was covered with a reddish wool, and long black hairs or bristles. The wool was short, and curled in locks; the bristles were of different lengths, varying from 1 to 18 inches. Some of this covering still remained attached to the skin, but the great mass was entirely separated from it. Mr. Adams collected 36 pounds, though much of it had been destroyed from the dampness of the place where it had lain so long. The animal was a male, and had a long mane on the neck. The entire carcass was removed to St. Petersburg, where it is now preserved. The tusks were repurchased, and added to the animal. It measures from the forepart of the skull to the end of the mutilated tail 16 ft. 4 inches; the height to the top of the dorsal spine is 9 ft. 4 inches; the length of the tusks along the curve is 9 ft. 6 inches. Portions of the hairy covering were deposited in the British Museum.

Taking the teeth as exhibiting clearly a marked difference in the recent species, the mammoth is easily separated from both by its broader grinders, which have narrower, and more numerous and close-set plates and ridges. The extinct genus Mastodon is distinguished from the elephant by the shape of the crown of its teeth.

The existence in northern Europe and Asia of the elephant and other genera, whose representatives are now found only in the tropics, led to the belief, that at the recent period in the world's history when they were its living inhabitants, a tropical temperature existed in the temperate zone, and stretched further n. toward the pole; but the discovery of this perfect animal showed that these huge elephants were adapted by their clothing to endure a cold climate, and by the structure of their teeth were able to employ as food the branches and foliage of the northern pines, birches, willows, etc. There are few generalizations more plausible at first sight than to predicate of an unknown species of a genus what is ascertained regarding the known members of the same genus. It required a striking case, such as that supplied by the discovery of the mammoth, to show clearly the fallacy of deductions almost universally received by scientific men not many years ago, which still occasionally mislead, and which even now are found in some popular handbooks of science.

EL'EPHANT, Sea (*Macrorhinus proboscideus*), known also as the Elephant Seal, the Proboscis Seal, etc.: largest of the seal family (*Phocidæ*), inhabitant of the seas

of the s. hemisphere, now named *Macrorhinus leoninus* (restoring Linnæus's specific name, but in masculine form); also the Californian Sea Elephant (*M. angustirostris*) of s. Cal. and Mex., now comparatively rare. The two much resemble each other, the n. species averaging 12–14 ft., but attaining 22 ft., the females much smaller and without proboscis; the s. species somewhat larger, and with short hair distributed in patches, giving it a spotted appearance somewhat like watered silk. The swimming-paws are large and powerful; the fore-paws have five nails, the thumb-nail easily distinguishable from the others; the hind paws have not even the rudiments of nails, but are beautifully constructed like the webbed foot of a bird, so as to expand, and increase the power of swimming. The true tail is very short, not more than six inches long. The head is larger in proportion than in many seals; the eyes are very large and prominent, with eyebrows of coarse hair; the whiskers are composed of very long and coarse spirally twisted hairs; there are no external ears; the canine teeth are remarkably large and massive, somewhat assuming the character of tusks. The nose of the males is very remarkable, being prolonged into a kind of proboscis about a foot long, which, however, is not at all an organ of prehension, and, indeed, seems to serve no purpose whatever analogous to those served by the proboscis of the elephant, but in its ordinary state hangs flaccid on the face, becoming distended like the wattle of a turkey when the animal is roused to passion of any kind, and in particular presenting this distended appearance during the rutting season. At that season, also, the males have furious combats, the victor winning for himself a whole herd of females. When the proboscis is dilated, the voice of the sea-elephant, usually like the lowing of an ox, is completely changed, and becomes a loud and extraordinary gurgling.

Sea-elephants are found on Kerguelen's Land, Juan Fernandez, south Georgia, the States Islands, South Shetland, the Falkland Islands, etc. They migrate southward at the beginning of summer, and northward at the approach of winter, thus avoiding the extremes of heat and cold. A single individual sometimes yields 1,400 or 1,500 pounds or 70 gallons of excellent oil, on account of which these animals are pursued to an extent that seems to have already much reduced the numbers of the species. They are either shot, or killed by means of long lances. Cuttle-fish and other cephalopods seem their principal food; but remains of marine plants also have been found in the stomach.

The skin of the sea-elephant is valueless for fur, but its thickness and strength make it very useful for harness-making and similar purposes. The flesh is black, oily, and indigestible; the tongue (salted) alone being esteemed a delicacy. The principal product, however, is the oil, which burns slowly, with a clear flame, and without smoke or disagreeable odor.

ELEPHANTA, *ĕl-ė-făn'ta:* island, 6 m. in circuit, in the harbor of Bombay (q.v.), about 7 m. e. of that city, about 5 m. w. of the mainland. It takes this its European name from a huge figure of an elephant near its principal landing-place, which, however, appears to have gradually crumbled away. This colossal animal has been cut out of a detached rock, apparently of basaltic origin. Further toward the interior, three temples, dug out of the mountain, present themselves—the roofs supported by curiously wrought pillars of various forms and magnitudes, and the walls thickly sculptured into all the varieties of Hindu mythology. The largest of the three excavations is nearly square, 133 ft. by 130½ ft.; and immediately fronting its main entrance stands a bust or third-length of a three-headed dêity, with a height of 18 ft., and a breadth of 23. These monuments of superstition, like the quadruped which guards, as it were, the approaches to them, are said to be rapidly decaying—which seems inconsistent with any high antiquity.

EL'EPHANT BAY: inlet of the Atlantic, on the coast of Benguela, s.w. Africa, lat. 13° 14′ s., and long. 12° 33′ e. It has excellent anchorage, but no fresh water.

ELEPHANT FISH (*Callorhynchus antarcticus*): a fish of the sub-class *Chimæroidea* or *Holocephali* (q.v.), found in southern seas, where it is the sole representative of its kind. The name alludes to the prominent projecting appendage of the snout. The young remain until an advanced stage of development within the remarkably horny egg-cases, where they are supplied by a current of water which enters and leaves by two pairs of orifices. The fish attains a considerable size and is sometimes eaten in New Zealand.

ELEPHANTIASIS: a disease endemic in certain parts of the tropics, which is characterized by a thickening, some enormous, of the skin and subcutaneous tissues. The swelling involves usually the leg, but sometimes attacks the upper extremities, the genital organs, or the face. The usual cause of tropical elephantiasis is a localized obstruction to the lymphatic vessels due to the presence of a parasitic worm, *Filaria sanguinis* (see FILARIASIS). In temperate regions, where the filaria is not found, elephantiasis is occasionally seen arising there from lymphangitis (q.v.) and subsequent obliteration of the lymph channels due to other, non-parasitic causes.

ELEPHANTINÉ, *ĕl-ė-fân'tē-nā:* small island of the Nile, opposite to Assouan (q.v.), anc. Syene; on the confines of Egypt and Nubia; 24° 5′ n. lat., and 32° 34′ e. long. From this island, the Greek mercenaries were sent by Psammitichus I. to recall the Egyptian deserters, and it was garrisoned in the time of the Pharaohs, Persians, and Romans. The island was anciently called *Abu*, or the 'ivory island,' having been the entrepôt of the trade in that precious material. The most important ruins are a gateway of the time of Alexander, and a small temple dedi-

cated to Khnum, the god of the waters, and his contemplar deities, Anubis and Sate. This temple was founded by Amenophis III., and embellished by Rameses III. Another remarkable edifice is the ancient Nilometer, formerly mentioned by Strabo, and which appears to have been built in the time of the Cæsars; and several remaining inscriptions record the heights of inundation from the time of Augustus to Severus. This island had the honor of giving a dynasty (the 5th) to Egypt, and was evidently an important place, the inscriptions on the rocks attesting the adoration paid by Sethos I., Psammitichus II., and other monarchs, to the local deities. Other interesting monuments have been found on this island; among which are part of a calendar recording the rise of the Dog-star in the reign of Thothmes III. (B.C. 1445), and numerous fragments of pottery—principally receipts in the Greek language—given by the farmers of taxes in the reign of the Antonines. The island is at present inhabited by Nubians.—Wilkinson, *Topography of Thebes*, p. 460; Champollion, *Notice Déscriptive*, p. 215; Champollion, *Lettres Écrites*, pp. 111, 157, 171, 382.

ELEPHANT RIVER: in the Cape Colony of s. Africa. It enters the Atlantic after a course of 140 m., about lat. 31½° s., and long. 18° east.

ELEPHANT SEAL: the largest of the eared seals (*Macrorhinus leoninus*), usually over 20 feet long, with a circumference of 12 feet around the thickest part of the chest. The female is much smaller than the male. In color, this seal is grayish; its body is covered with short hair, growing in patches, which gives a spotted look to the animal. The head is proportionately large, with prominent eyes and thick eyebrows; the whiskers are long; and the canine teeth are so large as to form heavy tusks. The nose of the males is prolonged into a proboscis about a foot long, which, seemingly useless, hangs loosely over the face. When this is dilated, it gives a new character to the creature's voice. This species has been almost exterminated, owing to the demand for its oil, though less than a century ago it was plentiful in the southern hemisphere. The skin is not valued for its fur and the flesh is not edible. The herds migrate southward in summer and northward in winter to avoid the extremes of temperature.

ELEPHANT'S FOOT, or HOTTENTOT'S BREAD (*Testudinaria elephantipes*): plant of the nat. ord. *Dioscoreaceæ* of which the root-stock forms a large fleshy mass, curiously truncate, or abruptly cut off at the end, so as somewhat to resemble an elephant's foot, and covered with a soft, corky, rough, and cracked bark. From this springs a climbing stem, which bears the leaves and flowers. The root-stock is used as food by the Hottentots.

The name ELEPHANT'S FOOT (*Elephantopus*) from the form of the root-leaves, is given also to a genus of plants of the nat. ord. *Compositæ*, sub-order *Corymbiferæ*, one spe-

cies of which (*E. scaber*) is common in elevated dry situations in all parts of India, and is used in Indian medicine in affections of the urinary organs.

ELETTA'RIA: see CARDAMOM.

ELETZ: see JELETZ.

ELEUSINE. *ĕl-ū-sī'nē:* genus of grasses, known as Crab-grass, Yard-grass. *E. Indica*, naturalized chiefly in the s. states, is called Dog's-tail or Wire-grass. Another E. Indian species, *E. corocana*, is cultivated and known as Natchnee, Nagla, Mand, or Murwa; it has digitate spikes finally incurved. The Tibetans make a weak beer, much in use among them, from this grain. *E. stricta* is cultivated as a grain-crop in the same parts of the world, and is, like the former, extremely productive. The grain called Tocusso in Abyssinia is a species of this genus, *E. Tocusso.*—A decoction of *E. Ægyptiaca* is used in Egypt for cleansing ulcers; and a drink made from the seeds is regarded as useful in diseases of the kidneys and bladder. A decoction of *E. Indica* is administered also to infants in Demerara, to prevent or cure convulsions.

ELEUSINIAN, a. *ĕl'ū-sĭn'ĭ-ăn:* relating to the anc. mysteries of Greece; pertaining to the rites in honor of Demeter or Ceres at *Eleusis*, in Greece. ELEUSINIAN MYSTERIES, sacred rites with which the annual festival of Ceres was celebrated at Eleusis (q.v.). Many traditions were afloat in ancient times as to the origin of this festival. Of these, the most generally accepted was to the effect that Ceres, wandering over the earth in quest of her daughter Proserpine, arrived at Eleusis, where she took rest on the *sorrowful stone* beside the well Callichorus. In return for some small acts of kindness, and to commemorate her visit, she taught Triptolemus the use of grain on the Rharian plain near the city, and instituted the mystic rites peculiarly known as hers. The outward method of the celebration of these mysteries is known with considerable accuracy of detail. Their esoteric significance is very variously interpreted. The ancients themselves generally believed that the doctrines revealed to the initiated gave them better hopes than other men enjoyed, both as to the present life and as to a future existence. Modern speculation has run wild in the attempt satisfactorily to explain these mysteries. As reasonable a solution as any other seems to be that of Bp. Thirlwall, who finds in them 'the remains of a worship which preceded the rise of the Hellenic mythology and its attendant rites, grounded on a view of nature, less fanciful, more earnest, and better fitted to awaken both philosophical thought and religious feeling.' The festival itself consisted of two parts, the greater and the lesser mysteries. The less important feast, serving as a sort of preparation for the greater, was held at Agræ, on the Ilissus. The celebration of the great mysteries began at Eleusis on the 15th day of Boëdromion, third month of the Attic year, and lasted over nine days. On the first day (called *agurmos*, the assembling), the neophytes, already initiated at the preparatory festival, met, and were instructed in their sacred du-

ties. On the second day (called Haladé, mystæ, *To the sea, ye initiated!*), they purified themselves by washing in the sea. On the third day, sacrifices, comprising, among other things, the mullet-fish, and cakes made of barley from the Rharian plain, were offered with special rites. The fourth day was devoted to the procession of the sacred basket of Ceres (the Kalathion). This basket, containing pomegranates, salt, poppy-seeds, etc., and followed by bands of women carrying smaller baskets similarly filled, was drawn in a consecrated cart through the streets, amid shouts of 'Hail, Ceres!' from the onlookers. The fifth day was known as the 'day of the torches,' and was thought to symbolize the wanderings of Ceres in quest of her daughter. On it the mystæ, led by the 'daduchus,' the *torch-bearer*, walked two by two to the temple of the goddess, and seem to have spent the night there. The sixth day, called Jacchus, in honor of the son of Ceres was the great day of the feast. On that day the statue of Jacchus was borne in pomp along the sacred way from the Ceramicus at Athens to Eleuis, where the votaries spent the night, and were initiated in the last mysteries. Till this stage of the proceedings, they had been only *mystæ;* but on the night of the sixth day they were admitted into the innermost sanctuary of the temple, and from being allowed to behold the sacred things, became entitled to be called 'epoptæ,' or 'ephori;' i.e., *spectators* or *contemplators*. They were once more purified, and repeated their original oath of secrecy with an imposing and awful ceremonial, somewhat resembling, it is conjectured, the forms of some existing secret societies. On the seventh day, the votaries returned to Athens with mirth and music, halting for awhile on the bridge over the Cephisus, and exercising their wit and satire against the spectators The eighth day was called Epidauria, and was believed to have been added to the original number of the days for the convenience of those who had been unable to attend the grand ceremonial of the sixth day. It was named in honor of Æsculapius, who arrived on one occasion from his native city of Epidaurus too late for the solemn rites, and the Athenians, unwilling to disappoint so distinguished a benefactor of mankind, added a supplementary day. On the ninth day took place the ceremony of the 'Plemochoæ,' in which two earthen vesselsfilled with wine were turned one toward the east, the other toward the west: the attendant priests, uttering some mystic words, then upset both vessels, and the wine so spilt was offered as a libation.

Initiation into the Eleusinia mysteries was compulsory on every freeborn Athenian; but slaves, prostitutes, and persons who had forfeited their citizenship were excluded from the rites. During the period of the festival, none of those taking part could be seized or arrested for any offense. Lycurgus, with a view to destroying distinctions of class, forbade any woman to ride to the Eleusinia in a chariot, under a penalty of 6,000 drachmæ. The mysteries were celebrated with the most scrupulous secrecy. No initiated person might reveal what he had seen under pain of death, and no uninitiated person could take part in the ceremonies

under the same penalty. The priests were chosen from the sacred family of the Eumolpidæ, whose ancestor, Eumolpus, had been the special favorite of Ceres. The chief priest was called the 'Hierophant,' or 'Mystagogue;' next in rank to him was the Daduchus, or Torch-bearer; after whom came the 'Hiero-Ceryx,' or Sacred Herald, and the priest at the altar. Besides these leading ministers, there was a multitude of inferior priests and servants.

ELEUSIS, *ė-lū'sĭs:* celebrated town in ancient Attica, near the n. shore of the Gulf of Salamis, not far from the confines of Megaris. It was famous as the chief seat of the worship of Ceres, whos mystic rites were here performed with great pomp and solemnity from the earliest authentic times till the era of Alaric: see ELEUSINIAN MYSTERIES. The temple of the goddess, designed by Ictinus, architect of the Parthenon, was the largest sacred edifice in Greece. The site of the old E. is now occupied by the little village of Lefsina or Lepsina.

ELEUTHERA, *ė-lū'thėr â:* one of the Bahamas (q.v.); next to New Providence, most populous island in the whole chain. It is more fertile than most of its neighbors, surpassing all of them especially in the growth of fruit, such as the pine-apple, the orange, and the lemon. Pop., with its dependent cayos or keys, 7,010.

ELEUTHERIA, *ĕl-ū-thē'rĭ-a:* Greek festival instituted after the battle of Platæa, B.C. 479, in memory of their triumphant repulse of the invasion of Xerxes.

ELEUTHERIA BARK, *ĕl-ū-thē'rĭ-a bârk:* name frequently given to the bark of the *Croton Eleutheria*, known also as Cascarilla Bark: see CASCARILLA. It is called Eleutheria (or Eleuthera) Bark, because gathered chiefly on the island of Eleuthera.

ELEUTHEROPETALOUS, a. *ĕl-ūth'ĕr ō-pĕt'ăl-ŭs* [Gr. *eleu'theros*, free; *petalon*, an unfolded leaf]: in *bot.*, polypetalous. ELEUTHEROSEP'ALOUS, a. *-sĕp'ăl-ŭs* [a simple arbitrary conversion of *petalon* into *sepalon*]: polysepalous.

ELEUTHERURUS, n. *ĕ-lū-thėr-ūr'ŭs*, [Gr. *eleutheros*, free; *oura*, tail]: in *zool.*, genus of *Pteropidæ*, frugivorous bats. *Eleutherurus ægyptiacus* is sculptured on the Egyptian monuments.

ELEVATE, v. *ĕl'ĕ-vāt* [L. *elĕvātus*, lifted up, raised—from *e*, out of; *lĕvō*, I raise; *levis*, light: F. *élever:* It. *elevare*]: to raise from a low place to a higher; to raise to a higher state or station; to exalt; to refine; to raise in mind and habits; to raise in height, as the voice. EL'EVATING, imp. EL'EVATED, pp. raised; exalted; dignified; excited; in *her.*, applied to wings turned upward EL'EVATOR, n. *-tėr*, one who, or that which, raises or exalts; a machine for raising weights or loads; in *anat.*, a muscle which serves to raise a part of the body; in *surg.*, an instrument for raising the depressed portion of a bone; also EL'EVA'TORY, n. *-tėr-ĭ*, an instrument for raising a depressed or a fractured part of the skull: ADJ. able or tending to raise. EL'EVA'TION, n. *-vā'shŭn* [F.—L.]: the act of raising from a lower to *a*

nigher state or condition; exaltation of character or style; raised ground; in *arch.*, sketch-plan of the flat side (usually front or principal) of a building, drawn with mathematical accuracy, but without the slightest regard to effect. ELEVATION, in *art*, a raising of the subject beyond its ordinary character in real life. A good instance is Rembrandt's *Adoration of the Shepherds*. All the objects and surroundings of the infant Savior are of the most homely description; yet the light represented as issuing from His person gives an elevation to the scene which takes from it entirely the character of being commonplace or vulgar. ELEVATION, in *astronomy* and *geography*, generally the height above the horizon of an object on the sphere, measured by the arc of a vertical circle through it and the zenith. Thus, the elevation of the equator is the arc of a meridian intercepted between the equator and the horizon of the place. The elevation of the pole is the complement of that of the equator, and is always equal to the latitude of the place. The elevation of a star or any other point, is similarly its height above the horizon, and is at its maximum when the star is on the meridian. The *angle of elevation*, is the angle through which a heavenly object appears elevated above the horizontal plane, to a spectator looking upward. ELEVATION OF THE HOST [see HOST 3]: in *R. Cath. Chh.*, the lifting up of the sacred elements of the Eucharist after consecration, that they may be seen of all the people. ELEVE, n. *ā-lēv'* [F. *élève*, a pupil; *élevé*, bred, educated]: one reared or protected by another; a pupil; a disciple.—SYN. of 'elevate': to raise; lift; heave; hoist; erect; heighten; elate; cheer; flush; excite; animate; ennoble; dignify.

ELEVATORS: the modern elevator is a direct evolution from the machine which Elisha G. Otis exhibited in 1853 at the World's Fair in the Crystal Palace, New York. Hoists of various kinds had been built before that time, but this was the first elevator wherein provision was made for stopping the fall of the car in the contingency of the breaking of the hoisting cables. During the next five years, a number of machines were built similar to that exhibited, all being driven by belts from line shafting. In 1859 the same inventor introduced an independent reversible engine directly connected to the hoisting machinery. In 1871 the hydraulic elevator was introduced, and thereafter was developed side by side with the steam machine. Finally in 1888, the electric elevator engine was introduced. There are, therefore, four general classes of elevators in use—hydraulic, electric, steam, and belt-driven. Steam machines may be dismissed with simply a reference, as machines of this class are seldom installed now except for freight purposes, having been replaced for passenger service by the newer hydraulic and electric types.

The type of elevator which is installed in greater numbers than any other is the vertical cylinder hydraulic machine. In this type, a cylinder of a diameter of, say from 8 to 24 inches (according to the water pressure and

the load to be lifted), is placed in a vertical position in the elevator shaft or in any other convenient location. Within this cylinder works a piston. Attached to the upper end of the piston rods are the sheaves over which pass the hoisting cables. The length of the cylinder will, of course, depend upon the car travel and on the gearing. The car in most general use is geared 4 to 1, although gears of 6 to 1 and 8 to 1 are quite common. For the ascent of the car, water under pressure admitted above the piston. For the descent of the car the pressure is shut off and the car descends by its unbalanced weight, the water above the piston flowing to the lower part of the cylinder through the pipe at the side known as the circulating pipe. The car is stopped at any desired point by closing a valve which both shuts off the water under pressure and closes up the path through the circulating pipe. Near the top of the circulating pipe is a simple device which limits to a predetermined maximum speed the rate at which water can flow into and out of the cylinder and therefore there is no possibility of the car moving at greater than the maximum speed in either direction.

The desired water pressure is generally obtained by suitable pumps which deliver through a pressure tank which takes up the pump pulsations. The hydraulic elevator engine is single-acting only—in fact, all styles of hydraulic machines possess this same characteristic, the car descending by its unbalanced weight (except in the pulling plunger type later to be described). It is customary with hydraulic elevators to partially counterbalance the weight of the car, leaving uncounterbalanced only sufficient weight to enable the car to descend at a proper speed.

Continuing the discussion of hydraulic elevators—in certain situations it is desirable to place all of the elevator machinery in the basement, and in such instances the cylinder is placed in a horizontal position. The horizontal cylinder hydraulic engine may be of either the 'pushing' pattern wherein the car is raised during the outward stroke of the piston or the 'pulling' pattern wherein the work is performed while the piston is being forced inward.

In the design of the modern city building it is highly desirable that as little space as possible be lost for rental purposes and the elevator builders have responded to this requirement by designing a high pressure machine which is much more compact than any other type of hydraulic elevator. By using a high pressure—700 to 800 pounds per square inch—the size of the entire apparatus including the hydraulic system and pipes can be greatly reduced. The cylinder is suspended in an inverted position so that the plunger, which works therein, on being forced downward causes the car to ascend. The high pressure hydraulic engine is also made with horizontal cylinder designed to be placed in the basement. In fact, the horizontal high pressure type is the latest development in elevator engineering. To maintain the pressure necessary for the

operation of this system an accumulator of the weighted type is substituted for the pressure tank used in the low pressure systems. The motion of the accumulator governs the pumps, controlling the delivery of water in accordance with the requirements of the service. This is accomplished either by mechanical connections to the steam valves, or by a series of switches when the pumps are driven by electric motors.

The pulling plunger type of hydraulic elevator differs from any other in that when lifting the load it does not consume water, but discharges it from the cylinder. In this elevator the weight of the plunger itself, which is of solid steel, lifts the load, the plunger descending into the cylinder as the car rises in the hatchway. For the descent of the car, the water is admitted at the required pressure under the plunger and, assisted by the weight of the car, raises the plunger and the car descends. The remaining class of hydraulic elevators is the plunger or direct lift type. In this type, a cylinder of a length equal to the car travel is set vertically in the ground. In this cylinder works a plunger of the same length, carrying the car on its top. Water is admitted to and discharged from the cylinder at the top, the annular space around the plunger affording ample passageway for the water. As usual, water under pressure is admitted to the cylinder for the ascent of the car and for the descent is allowed to run out.

Electric Elevators.—The construction of a modern electric elevator engine may be described as follows: A motor is connected to suitable winding machinery by means of a worm shaft (a continuation of the armature shaft) engaging with one or two worm wheels, the latter being rigidly connected to the winding drum (in the case of elevators for ordinary freight or passenger service) or connected by means of suitable gearing (for hoists of very large capacities). On the armature shaft and worm shaft a brake wheel is mounted. A brake band is normally held tightly against this wheel by a heavy spring, thus locking the elevator engine. On starting the motor, current is also admitted to a solenoid, the action of which removes the tension from the brake band, allowing a free movement of the motor shaft. On the stopping of the current, the brake is instantly applied by the spring.

Various electric controlling devices have been used with electric elevators. The one most generally used as being the most perfect, operates on the following principle:

On starting the car, the attendant therein moves the lever or switch (as the case may be). This movement admits starting current only to the motor, and thereafter the operations are entirely automatic. As the motor accelerates, the starting resistance is cut out step by step automatically by a series of magnets and thus the current is absolutely prevented from increasing above the amount for which the motor is designed, and a gentle and uniform acceleration is secured.

The electric elevator with push-button control, is a type designed particularly for private residences. No attendant is required and the elevator is always ready for service. A passenger desiring to use the elevator presses a button placed near the elevator shaft, and the car, if not in use, immediately travels to that floor and stops automatically. When the car has come to rest at that floor, the door can be opened.

In the duplex motor electric elevator the drum is dispensed with and a sheave is placed on the end of each of the two armature shafts and endless cables pass round these sheaves and are connected to the car and also to the counter-weights by running sheaves. The motors run in opposite directions, and as one or the other of the motors accelerates, the car moves up or down in the hatch-way, its speed being proportional to the difference of speed of the two motors. When both motors are running at the same rate of speed the car is stationary.

ELEVEN, n. *ĕ-lĕv′n* [AS. *endleofan;* Goth. *ainlif*, eleven, literally one placed upon ten: Lith. *likti*, to remain over: comp. first syllables of Gr. *leipein*, to leave; L. *lictus*, left]: ten and one added. ELEV′ENTH, a. *-lĕv′nth*, next after the tenth; in *music*, interval of the octave above the fourth. ELEV′ENTHLY, ad. *-lĭ*, in the eleventh place. *Note.*—Skeat suggests Goth. *ainlif*—from *ain*, one; *lif* = Lith. *lika* = L. *decem*, ten, by the change of *l* to *d*.

ELF, n. *ĕlf*, ELVES, n. plu. *ĕlvz* [AS. *ælf;* Icel. *alfr;* Ger. *alp*, supernatural beings of the Northern mythology]: a fairy; a wandering spirit; an undersized or mischievous demon (see FAIRIES). ELFIN, a. *ĕlf′ĭn*, of or relating to elves: N. playfully applied to a child, as being small and mischievous. ELF′ISH, a. resembling an elf; in secret disguise. ELVAN, a. *ĕlv′ăn*, same as ELFISH. ELF, v. *ĕlf* [Gael. *ailbheag*, a ring, a curl]: in *OE.*, to twist and entangle the hair in rings and knots. ELF-LOCK, in *OE.*, matted or intricately entangled hair. ELVISH, a. *ĕlv′ĭsh*, in *OE.*, from ELFISH. ELF-FIRE, the Will-o'-the-wisp.

ELF-ARROW-HEADS, or ELFIN-ARROWS, or ELF-BOLTS, or ELF-DARTS, or ELF-SHOT, or ELF-STONES: names popularly given to the artificial arrow-heads of flint in use at an early period among barbarous tribes of Europe generally, as still among the American Indians, the Esquimaux of the Arctic regions, and the inhabitants of some of the islands in the Pacific Ocean. These are often included under the general term Celt (q.v.). The elf-arrow-head was occasionally set in silver, so as to be worn on the person as a talisman, or had a hole drilled through it, so that it might be dipped in water, which, being thus endowed with healing virtue, was used sometimes as a wash, more commonly as a draught. As a talisman, the elf-arrow-head was believed most efficacious as a preservative from poison and witchcraft. Examples of 'elf-arrow-heads' may be seen in most museums of antiquities. See CELT; FLINT IMPLEMENTS AND WEAPONS.

ELGAR, Edward William, English composer: b. Broadheath, Worcestershire, 1857, June 2. Among his compositions are: *The Black Knight* (1892); *Choral Suite: from the Bavarian Highlands* (1895); *Lux Christi*, produced at the Worcester Festival (1896); *Te Deum*, sung at the Hereford Festival (1897); *Caractacus*, produced at the Leeds Festival (1898); *Sea Pictures*, for the Norwich Festival (1899); *Dream of Gerontius*, for the Birmingham Festival (1900); *Coronation Ode* (1902); etc. Since 1904 he has been Richard Peyton professor of music in Birmingham University.

EL-GHOR ('the long valley'): modern name of the valley of the Jordan and the Dead Sea from Mount Hermon to the Akrabbim or chalk cliffs six m. s. of the Dead Sea. Its length between the Sea of Galilee and the Dead Sea, is about 65 Eng. miles. At its n. end it is about six m. wide, and at Jericho twelve. Its w. wall is a series of precipitous and desolate cliffs, 800 to 1,200 ft. high. On its e. side the hills are still higher. Between the two seas an abrupt ridge (Kurn Surtabeh) divides the Ghor into two parts; the n. over 40 m. long, is well watered, and might be made very productive; the s., about 20 m. long, is covered with a white nitrous crust which makes it hopelessly desolate. The difference of level between the seas (according to Lieut. Lynch's measurement) is 660 ft., giving a descent of 10 ft. to a mile. Within this valley is a second depression (also extending n. to s.) 40 to 150 ft. lower. Through it the Jordan flows with a very winding course which makes it 200 m. long. The descent being steep and broken, the navigation of the river is always perilous and, under ordinary circumstances, impossible. Lynch and his party, having many advantages and safeguards, accomplished the passage (1848) through the whole distance; having plunged down many dangerous rapids, and barely escaping with their lives.

ELGIN, *ĕl'jĭn:* city of Kane co., Ill.; on both sides of the Fox river; at junction of the Chicago and Northwestern, and the Chicago and Pacific railroads; 20 m. n. of Aurora, 36 m. w.n.w. of Chicago, 50 m. e.s.e. of Rockland. It is also the terminus of the Aurora, Elgin & Chicago Railway, which is a third-rail electric line bebetween these cities, and is the finest road of its kind in existence.

Industries, etc.—Two products make Elgin famous—butter and watches. The dairy interests have probably had more to do with the development of the community than any other factor. Early in its history, The Borden Condensed Milk Company located a large plant here and since that time has established many more in the immediate vicinity. The current quotations of the Elgin Broard of Trade fix the market price of high grade butter throughout the entire country. The other industry to which Elgin largely owes its growth and prosperity is the making of fine watch-movements. The watch factory

was started in the spring of 1864, and has been a success from the beginning. There are many other industries in Elgin, all of which are prosperous concerns. Two watch-case factories and as many shirt factories distribute their products throughout the country. Besides these, there are shoe, pipe-organ, automobile, coffin-fixtures, canning, malted-milk, and rug factories. Two large publishing houses are located here, and there are several machine shops and foundries.

Public Institutions, Buildings, etc.—The Elgin Academy of the Northwestern University is a well-known preparatory school for the latter institution, which is located at Evanston, Ill. Saint Mary's Academy is also well known throughout the state and bears a high reputation as a place of learning. The Illinois Northern Hospital for the Insane is located in Elgin. The Elgin Woman's Club built and operates a hospital. The banks are six in number, four national and two savings.

History, Government, etc.—Founded in the spring of 1835, Elgin has grown rapidly in size and importance until it now is the most beautiful and the second largest city in Kane county. Elgin was incorporated in 1854. The water-works and sewer system and an electric lighting plant are the property of the municipality and its bonded indebtedness is small. Pop. (1910) 25,976.

EL'GIN AND KINCAR'DINE (James Bruce), eighth Earl of: 1811, July 20—1863, Nov. 10. Gov. Gen of India: b. in Park Lane, London; son of Thomas Bruce, seventh Earl, who secured Elgin Marbles (q.v.). He went to Christ Church, Oxford; became Fellow of Merton, and graduated M.A. 1835. He entered public life 1841, was elected to parliament for Southampton—but the election was declared void—and, through the death of his father, succeeding to a Scotch peerage, he was, in his own words, 'expelled from the house of commons without being admitted into the house of peers.' He was made gov. of Jamaica 1842; and in 1846 became gov. gen. of Canada, under the administration of Lord J. Russell. His administration in Canada was a model of colonial government. During his rule, 1847–55, the revenue of Canada was quadrupled. He was summoned to the house of lords 1849 as a peer of the United Kingdom, and was appointed lord lieut. of Fifeshire. Under appointment as Plenipotentiary Extraordinary he started, 1857, for China with an army, to settle various difficulties. But before he reached his destination the Indian mutiny broke out, and Lord Elgin unhesitatingly dispatched the Chinese expedition to Lord Canning's assistance; and the English in India were thus enabled to hold their ground until re-enforcements arrived. Afterward, 1858, he negotiated with China the favorable treaty of Tien-Tsin; also a treaty with Japan. On his return home, he was appointed postmaster-general. On the expiration of Viscount Canning's term of service, Lord Palmerston appointed Lord Elgin governor-general of India (1861).

EL'GIN MARBLES: celebrated collection of ancient sculptures, brought from Greece by Thomas, seventh Earl of Elgin, and acquired from him by the nation for the British Museum 1816, at the sum of £35,000.

These sculptures adorned certain buildings on the Acropolis of Athens; the chief portions, from the Parthenon or

Theseus.

Temple of Minerva, were designed by Phidias, and executed by him, or under his superintendence. They consist of—1. Portions of several of the statues that were in the east and west tympana or pediments, the most important of which are the Theseus or Hercules, Ilissus or river-god, upper

Metope:
From the Parthenon.

portions of the torsos of Neptune and Minerva, Iris, torso of Cecrops, Ceres, and Proserpine, the Fates, heads of the horses of Hyperion, and one of the horses of Night. Of al

these, the Theseus, and the head of the horse of Night, are the most perfect, the former wanting only the hands and feet and part of the nose, while even the surface of the latter is very little injured. But however mutilated, the greatness in style of these magnificent works is clearly manifest, and from the merest fragment valuable instruction in art may be obtained. 2. Fifteen metopes, executed in high relief representing the battle of the Centaurs and Lapithæ. A metope is the interval between the triglyphs on a Doric frieze—in the Parthenon, there were 92, 14 on each front, and 32 on each flank of the temple—and on every metope, a Centaur engaged in conflict with one of the Lapithæ is represented in a style of the highest excellence in point of spirit and truthfulness. 3. A large portion of the frieze of the outer walls of the cella. This remarkable work represents the solemn procession to the Temple of Minerva during the Panathenaic festival, and has never been equalled for elegance of composition and the variety and gracefulness of the figures. It is executed in low relief, in order to adapt it to the light, for placed within the colonnade, it received its light between the columns, and by reflection, from the pavement below. This exquisite frieze occupied, slab after slab, a space of 524 ft. in length. The remains

Portion of Panathenaic Frieze.

of it in the British Museum on slabs and fragments of marble are to the extent of upward of 249 ft., besides 76 ft. in plaster casts.

Although the Elgin Marbles are now acknowledged the most precious collection existing of specimens of Greek art in its purest state, yet it was only after considerable hesitation that government consented to purchase them, and then the sum awarded was not only far short of their value, but also far short of Lord Elgin's expense in procuring them. Again, from petty jealousy, some of the connoisseurs of the day underrated these great works:

while others, like Lord Byron, from feelings apparently generous, but quite mistaken, heaped obloquy on Lord Elgin, and opposed their acquisition. But it has been clearly proved that Lord Elgin, so far from destroying, saved these master-pieces from destruction. M. Viardot, author of *Les Musées d'Europe,* remarks: 'It is said that, to justify the appropriation of the Lahore diamond, the English allege that if they have taken it, it was merely to prevent its appropriation by others. They may give the same excuse for their appropriation of the marbles of the Parthenon. No doubt, Lord Elgin has carried them off; and the Greeks of the present day, seeing the old temple of their Acropolis despoiled of all of its ornaments, have a good right to curse the despoiler. But when we think of the devastation these works have so often experienced, to the total destruction of the principal statues, and the shameful mutilation of the others, and the risk these last ran of being entirely destroyed in their turn—when we consider that these precious relics of art are conserved in a place of surety, and placed in the centre of artistic Europe, one loses the desire, and almost the right to charge the English with piracy and robbery. For my part, if, in the course of my long devotion to the marbles of Phidias, a regret has come to trouble the ardent pleasure of my admiration, it was, that the robber of these marbles was not a Frenchman, and their resting-place the Museum of Paris.'—*Visconti on the Sculptures in the Collection of the Earl of Elgin* (John Murray, London, 1816), *Library of Entertaining Knowledge—British Museum* (London, Charles Knight).

ELGINSHIRE, *ĕl'gĭn-shēr,* or MORAYSHIRE, or MURRAYSHIRE, *mŭr'ĭ-shēr:* maritime county in the n.e of Scotland, on the Moray Firth; 30 m. long, 20 m. broad; 482 square m. About a third part was formerly cut off on the s. by a detached part of Inverness-shire; but by an act of parliament, passed in 1870, this part was annexed to Inverness-shire, and a part of the intervening portion of Inverness-shire, of about the same extent, rental, and population, was annexed to Elginshire. In the s. are the high and rugged Monadhliadh Mountains of Inverness-shire, dividing the basins of the Spey and Findhorn, and forking in the n. to include the basin of the Lossie. In the s., gneiss predominates, with a little granite; and in the n., sandstone with fish and reptilian remains, and small patches of oolitic and Wealden strata. West of the Findhorn mouth are the sand-dunes of Culbin, three sq. m. in extent, some of them rising 118 ft. Great masses of peat and trunks of trees are often cast ashore near the mouth of the Findhorn. The climate is mild and dry, and the county has been called the Devonshire of Scotland, the mountains of Aberdeenshire and Banffshire protecting it from the cold moist winds of the German Ocean. The soil is open, sandy and gravelly, and very fertile in the n. with some deep loams and clays. Somewhat over a third of the county—105,226 acres—is cultivated, the chief crops being oats, barley, and turnips. The chief exports are grain.

cattle, salmon, and timber. There are some manufactures of woolens and malt liquors, but distilling is the leading industry. Valuable sandstone quarries are also worked, and the fisheries actively engage a great number of boats, men and boys, the annual yield, chiefly herring, averaging $162,500. E. unites with Nairnshire in sending one member to parliament. It contains 14 entire parishes, and 8 parts of parishes. The ancient province of Moray included the counties of Elgin and Nairn, and parts of those of Inverness and Banff. Scandinavians early settled in it. About 1160, Malcolm IV. subdued it. The chief antiquities are Elgin Cathedral, Spynie Castle, Duffus Castle, Pluscarden Abbey, Kinloss Abbey, and the Norman parish church of Birnie. Burghead, on the coast, is supposed by many to have been a Roman station, but its ramparts and ditches, now almost destroyed, were probably of more recent origin. It was the last stronghold of the Norsemen in this part of Scotland. E. was overrun in the civil war of Montrose, 1645, etc.—Pop. 44,800.

E'LIA: see LAMB, CHARLES.

ELIAS, *ė-lī'as*, MOUNT ST.: mountain on the n.w. coast of America, lat 60° 18′ n., long. 140° 30′ w. 18,023 ft. high; long supposed to be the highest peak in N. America, but found by the international boundary survey of 1894 to be overtopped by Mt. Logan on Canadian soil, 19,500 ft., and Mt. Wrangle in Alaska, still higher but not yet accurately surveyed.

ELIASITE, n. *ē-lī'as-īt* [named from the *Elias* mine, Joachimsthal, where it occurs]: subtranslucent or opaque mineral occurring in shapeless masses. There are two varieties: E. proper, reddish-brown; and pittinite, black; both closely akin to gummite, an alteration-product of uraninite.

ELICIT, v. *ĕ-lĭs'ĭt* [L. *elĭcĭtus*, drawn out, lured forth —from *e*, out of; *lacĭō*, I allure: It. *elicere*]: to draw out; to extract; to deduce by reason or argument, ELIC'ITING, imp. ELIC'ITED, pp. ELIC'ITA'TION, n. *-ĭ-tā'shŭn*, the act of eliciting or drawing out.

ELIDE, v. *ĕ-līd'* [L. *elīdĕrĕ*, to strike out—from *e*, out of; *lædo*, I strike forcibly, I hurt: F. *élider*]: to cut off or suppress a vowel or syllable, usually a final one. ELI'DING, imp. ELI'DED, pp. ELI'SION, n. *-lĭzh'ŭn* [F.—L.]: the cutting off or suppression of a vowel or syllable at the end of a word, as in poetry, in order to make the lines of the requisite length.

ÉLIE DE BEAUMONT, *ā-lē'dėh bō-mōng'*, JEAN BAPTISTE ARMAND LOUIS LEONCE: 1798, Sep. 25—1874, Sep. 21; b. Canon, France: geologist. He was educated in the Polytechnic School; made a series of metallurgical explorations for the govt. 1821-24, and was appointed a mining engineer on his return; became prof. at the school of mines 1829, prof. of geology in the College of France 1832; chief engineer of

mines 1833; member of the Institute 1835; and perpetual sec. of the Acad. of Sciences, succeeding Arago, 1853. In his *Treatise on the Mountain Systems* (1852), he described 95 distinct systems.

ELI, ELI, LAMA SABACHTHANI? *ē'lī ē'lī lā'mă sa'băk-thā'nī* [Syro-Chaldaic tongue; called also Hebrew-Syriac]: 'My God, my God, why hast Thou forsaken me?' —the exclamation of Jesus Christ on the cross in His extreme agony; also ELOI, ELOI, etc., *ĕl'ō-ī ĕl'ō-ī*.

ELIGIBLE, a. *ĕl'ī-jĭ-bl* [F. *éligible*—from mid. L. *eligĭbĭlis*—from L. *elĭgō*, I choose or pick out—from *e*, out of; *lego*, I choose]: fit to be chosen; suitable; proper; legally qualified; desirable. EL'IGIBLY, ad. *-jĭ-blĭ*. EL'IGIBLENESS, n. *-bl-nĕs*, or EL'IGIBIL'ITY, n. *-bĭl'ĭ-tĭ*, worthiness or fitness to be chosen; that which renders one thing preferable to another.

ELIJAH, *ē-lī'jah* (Gr., in the New Testament, ELIAS): greatest of the prophets of Israel; born at Tishbe, in Gilead, on the borders of the desert. He comes upon the scene in the time of Ahab, about B.C. 920. When that monarch, to please his Phœnician wife Jezebel, had introduced, on an extensive scale, the polluted worship of Baal, E. pronounced a curse on the *land*. The prophet had to flee. He took refuge by the brook Cherith, probably one of the torrents that cleave the high table-land of his native region. Here he was miraculously fed by ravens. He then went to Zarephath, a town between Tyre and Sidon. Here he lodged with a widow woman, prolonged her scant supply of oil and meal, and brought back her son to health from the brink of the grave. Subsequently, he made a temporary reconciliation with Ahab, and on Mount Carmel executed dreadful vengeance on the prophets of Baal, slaying 400 with his own hand. Such a deed enraged Queen Jezebel to the utmost. She swore to destroy the prophet, who once more took refuge in flight. He rested not till he reached Beersheba in the far south, on the edge of the desert that leads down to Sinai. The brief allusion in Scripture to his weary wandering is very touching. At last he comes to Horeb, where he is brought into personal converse with Jehovah. The passage in which this is recorded is one of the grandest and most significant in the Old Testament. He then receives certain instructions from Jehovah, among others that he should select Elisha to be prophet in his room. E.'s next appearance is when Ahab rides forth to take possession of Naboth's vineyard: he denounces the murderous monarch, and utters an awful prophetic curse on him and his wife. After the death of Ahab, he with fearful solemnity and sternness rebukes the idolatries of his son Ahaziah; and after the death of King Ahaziah, we find E. interfering in the affairs of the king of Judah, who had married a daughter of Ahab, and begun to 'walk in the ways of the kings of Israel.' He denounced his evil doings, and predicted his death. The closing scene of his life on earth and of his translation without death, is exquisitely narrated. A

CHARLES WILLIAM ELIOT.
President of Harvard University.

chariot of fire and horses of fire appeared after he with Elisha had crossed the Jordan, and 'Elijah went up by a whirlwind into heaven.' Elijah is one of the grandest and loftiest figures on human records—in times of abounding evil, a stern, solitary, uncompromising reprover of kings, and reformer of the nation, a mighty prophetic monitor from Jehovah.

ELIMINATE, v. *ĕ-lĭm′ĭ-nāt* [L. *elimĭnātus*, turned out of doors—from *e*, out of; *līmen*, a threshold: It. *eliminare:* F. *éliminer*]: to set at liberty; to get rid of anything; to throw out or reject something from an argument; in *algebra*, to cause a quantity to disappear from an equation; to disengage; to separate. ELIM′INATING, imp. ELIM′INATED, pp. ELIM′INA′TION, n. *-nā′shŭn* [F.—L.]: the act of expelling or discharging. In *algebra*, a process by which, where we have a sufficient number of statements concerning several quantities, we can obtain a separate statement concerning each. Thus, an operation which consists in riddance of a quantity or letter which is common, say, to two equations, by forming out of the two a new equation, in such a way as to make the quantity in question disappear. If three unknown quantities, for instance, are to be found from three independent equations, the first step is to form out of the three given equations two new equations, so as to eliminate one of the unknown quantities; from these two equations another of the quantities is eliminated in the same way, giving one equation with one unknown quantity, the value of which is then found. Methods for abbreviating the labor of elimination are employed in higher mathematics, notably the use of Determinants (q.v.). Elimination is an important process in other sorts of reasoning besides the mathematical; in this larger acceptation, it means the setting aside of all extraneous considerations—of everything not essential to the result. In astronomical observations, the elimination of errors of observation is often effected by repeating the observations several times in such a way as to cause the errors to be of opposite kinds, then adding the observed values, and taking their average.

ELIOT, *ĕl′ĭ-ot*, CHARLES WILLIAM, LL.D.: b. Boson, 1834, Mar. 20: educator. He studied in the Boston Latin School; graduated at Harvard Univ. 1853; was tutor in mathematics there 1854–58; asst. prof. of mathematics and chemistry 1858–61; prof. of chemistry in the Lawrence Scientific School 1861-63; travelled and studied in Europe 1863–65; prof. of chemistry in the Mass. Institute of Technology 1865–69; and was elected pres. of Harvard Univ., succeeding Dr. Thomas Hill, 1869, May 19. Beside numerous addresses, chemical memoirs, and technical investigations, he has published in conjunction with Prof. F. H. Storer, a *Manual of Inorganic Chemistry* (N. Y. 1869); a *Manual of Qualitative Chemical Analysis* (1869); *Five American Contributions to Civilization and Other*

Essays; Educational Reform; Charles Eliot—Landscape Architect (1902); *More Money for the Public Schools* (1903); *John Gilley* (1904); *The Happy Life* (new ed., 1905); etc.

EL'IOT, GEORGE: see EVANS, MARIAN.

ELIOT, JOHN: 'the apostle to the Indians': 1604–90; b. Nasing, England. He graduated at Cambridge 1622, and was ordained in the Church of England, but under persecution as a non-conformist came to Boston, Mass., 1631. He became pastor of the church (Congl.) in Roxbury 1632. Soon afterward, having, with the aid of a captive Pequot, gained some knowledge of the language of the Indians (whom he regarded as portions of the lost tribes of Israel), he began to preach to them at Nonantum (now Brighton), four m. from Roxbury. He translated for them the ten commandments, the Lord's prayer, and many texts of Scripture. As the fruit of his labor a settlement of Christian Indians was formed. This (1651) was removed 8 m. away to Natick, where an Indian church was organized 1660. In aid of these labors, an English missionary soc. sent him £50 annually to supplement his salary of £60 at Roxbury. In 1653, he published an Indian catechism, and in 1665, a tract containing a statement of the belief and experience of his converts. Having been strenuously employed many years (with aid from the Rev. John Cotton of Plymouth, Mass.) in translating the Scriptures, he published the New Testament 1661, and the Old, 1663. A second edition of the New Testament was published 1680, and of the Old, five years later. His *Indian Grammar Begun*, printed 1666 (reprinted 1822), has these words at the close: 'Prayers and pains, through faith in Jesus Christ, will do anything.' Of his *Indian Primer* (1669) a copy has been preserved in the library of the Univ. of Edinburgh. From this it was reprinted 1877. Copies of his Indian Bible are now very rare, and few persons, if any, can read it. But his labors are still useful to those who study the structure and character of unwritten dialects. Eliot published also many treatises in the English language. Among these were: *Indian Dialogues* (of which a copy is preserved in a private library in New York); *The Logick Primer* (one copy in the British Museum, another in the Bodleian Library); *The Christian Commonwealth*, or *The Civil Policy of the Rising Kingdom of Jesus Christ*. This was published in London, and, because it favored a republican form of government, was charged with teaching sedition. Parts of it were condemned by the governor and council of Massachusetts. Almost to the last Eliot's diligence in writing was maintained. He was charitable to the poor even to excess. Nearly all his salary from England he gave to the Indians; and on one occasion the parish treasurer of Roxbury tied up the money paid him in a handkerchief with hard knots to prevent his giving it away before he reached home. But Eliot went at once to a family who were sick and poor,

and, telling them that God had sent them relief, tried to untie the knots. Finding the task difficult, he gave them handkerchief and all, saying 'Take it; God seems to intend that you shall have the whole.' He was greatly beloved for his pure life and gentle manners in village homes and Indian huts. He died in Roxbury, where he had lived and labored nearly 60 years. All New England lamented his death as a public calamity.

ELIOT, Sir JOHN: 1592, Apr.—1632, Nov. 27; b. Port Eliot, England: statesman. He entered Exeter College, Oxford, when 15 years old, and on completing his univ. course travelled extensively in France, Italy, and Spain, with the future Duke of Buckingham, and began studying law in one of the inns of court. In 1612 he married the daughter of a wealthy neighbor, 1614 was elected a member of parliament, and 1619 was appointed vice-admiral of Devon and intrusted with large powers for the defense of the commerce of the county. He entered upon his naval duties with remarkable energy, and directed his first efforts to the capture of Nutt, a famous pirate, who had inflicted immense damage upon the commerce of the s. coast of England for several years, and who was known to have powerful friends at court. After many attempts he caught the pirate, 1623, but his adroitness proved of no immediate avail, as Nutt was speedily released to continue his plundering, while E. was arrested on groundless charges and confined in the Marshalsea four months. In 1624, Feb., he was elected to parliament for Newport. Believing that the success of the popular cause required the entire independence of parliament, he proposed at an early day that the deliberations of the house of commons should be kept strictly secret. His boldness attracted a large share of official and popular attention: and this element combined with his intense energy, personal bravery, resoluteness, and high oratorical gifts, made him the foremost leader in the commons during the first three parliaments of the reign of Charles I, though such patriots as Pym, Hampden, Selden, and Coke were members at the time. He courageously exposed the abuses which oppressed England through illegal exactions and the venality of the executive; urged parliament to demand an account of the expenditure of the supplies that it had voted, and to refuse further supplies till an accounting was made; repeatedly charged the Duke of Buckingham, the king's favorite, with the responsibility for the general misgovernment; and was sent to the Tower 1626 for comparing the duke with Sejanus. The commons espoused his cause, refused to transact any business till he was released, and upon his reappearance voted him free from fault. Later in the year he was confined in the Gatehouse, whence he personally petitioned the king against further forced loans, was deprived of his office of vice-admiral, and had a sentence of outlawry passed upon him. In 1628 he was elected to parliament for Cornwall, and vehemently urged the commons to vote no further supplies till they obtained redress of their grievances. He was one of the framers of the 'petition of right,' and when an evasive response was given to it, reviewed the events of the

whole reign, and proposed a remonstrance to the king, naming Buckingham as the cause of the country's wretchedness. On the last day of that parliament, while Holles and Valentine held the speaker of the house in the chair by force, he protested against levying tonnage, poundage, and other duties without the consent of parliament. Upon the dissolution of parliament he was again sent to the Tower for refusing to answer for his conduct in parliament anywhere except before parliament. He was closely confined till May, then taken before the court of king's bench where he again refused to answer, was condemned to pay a fine of $10,000 and be imprisoned during the king's pleasure; was placed in solitary confinement 1631, Dec., and died while awaiting an answer to a petition to the king for a temporary release on account of his health.

ELIQUATION, n. *ĕl'ĭ-kwā'shŭn* [L. *elīquātus*, melted out—from *e*, out; *līquo*, I melt]: the separation of substances that melt at different temperatures by raising the heat sufficient to melt the one but not the other.

ELIS, *ē'lĭs*: one of the ancient divisions of the Peloponnesus, bounded n. and n.e. by Achaia, e. and s. by Arcadia, w. by the Ionian Sea. It was originally divided into three districts—Cœle or Hollow Elis, Pisatis, and Triphylia. Of these, the first-named was by far the largest and most valuable, comprising the broad and fertile plains watered by the Peneus and the Ladon, and producing excellent crops of grain, cotton, and flax; while the pastures by the river-banks reared cattle and horses of proverbial excellence. This district, from its fertility, was called 'the milk-cow of the Morea.' Pisatis is drained by the Alpheus, and is separated from Cœle Elis by Mount Pholoë, a spur of Erymanthus. The low grounds of this division have great natural fertility. Most of the surface of Triphylia is hilly, occupied with offshoots from the great Arcadian ranges. It is separated from Pisatis by the Alpheus, on whose banks were the grove and temple of Olympic Jove, and the plain in which the great Olympic games were celebrated. Though E. had few facilities for preventing invasion, it yet suffered less from war than any other of the Greek states—an advantage due chiefly to the sacred character of the country, as the seat of the greatest of the national festivals. Their prerogative of holding the Olympic games gave the Eleans a prestige which continued in greater or less degree till the games themselves were suppressed by Emperor Theodosius A.D. 394

ELIS, now *Kaloscopi*, cap. of the country of E., stood on the Peneus, and was long famous as one of the most splendid and populous cities of Greece. It was at one time strongly fortified, and contained many magnificent buildings, conspicuous among which was the Gymnasium, in which it was necessary that all athletes intending to take part in the Olympic games should go through a month's training before they were allowed to compete. See Leake's *Morea*, and Curtius's *Peloponnesus*.

ELISHA, *ē-lī'sha:* died abt. B.C. 840. Prophet of Israel,

successor of Elijah, who found him at the plough, and called and consecrated him to the sacred office by throwing his mantle over his shoulders. He exercised his functions for 55 years. When Elijah was carried up into heaven, Elisha returned to Jericho, where he dwelt for some time. He then went to Bethel, where occurred the destruction of the 42 children by the two she-bears. After this period, he seems, besides performing an extraordinary number of miracles, to have been active in the religious politics of his country, but he showed nothing of the fiery and sanguinary zeal of his master. Mild, tolerant, conciliatory, he is scarcely ever, if at all, found rebuking the Baal-worship still prevalent in Israel. Many wonderful incidents have place in his history; such as those of the invisible horses and chariots of fire round about Elisha on the hillside, of the smiting of the Syrian host with blindness, so that the prophet led them all unconsciously into Samaria captive, etc. With Elijah it has been said (see Smith's *Dictionary of the Bible*, Art. 'Elisha'), the miracles are introduced as means toward great ends, and are kept in complete subordination thereto. But with Elisha, as he is pictured in the Hebrew narrative, the case is reversed; with him, the miracles are everything, the prophet's other work is of small moment. The man who was for years the intimate companion of Elijah, on whom Elijah's mantle descended, appears chiefly as a worker of prodigies, a predicter of future events, a revealer of secrets, and things happening out of sight or at a distance. Some commentators have hence felt some difficulty in the literal acceptance of the narrative of Elisha's miracles, which difficulties have been dealt with by various methods, more or less satisfactory. For several years Elisha was the chief theocratical counselor of King Jehoram. Under the reign of Jehu and his successors, he gradually withdrew from public affairs, and died in Samaria in the reign of Jehoash, grandson of Jehu. A parallel has been drawn between Elisha and Christ, occasioned by his mildness and gentleness; but this must be deemed quite superficial, and without warrant in the Biblical records. Elisha is canonized in the Greek Church; his day is June 14.

ÉLITE, n. *ā-lēt'* [F. *élite*—from L. *ĕlĭgĕrĕ*, to choose out]: the flower of an army; a select circle or chosen part; the chosen representatives of society, art, science, literature, or the like.

ELIXIR, n. *ĕ-lĭks'ĕr* [Ar. *eliks'ir*, the philosopher's stone, the life-prolonging tincture of gold: F. and Sp. *elixir*]: a refined spirit; a cordial which invigorates; the quintessence of any substance. The term as now used in pharmacy, has come down from the days of alchemy when it denoted a supposed magical liquor for conferring immortality, which concoction was earnestly sought after by the old alchemists. It is applied to various preparations, consisting mostly of solutions of aromatic and bitter vegetable substances in spirits of wine. The term tincture is now more common.

ELIZABETHAN AR′CHITECTURE, *ė-lĭz′a-bĕth-an:* mixed style which sprang up on the decline of Gothic architecture. By some it is called the Tudor style, but that name belongs more correctly to the Perpendicular, or latest kind of Gothic. The Elizabethan is exemplified chiefly by mansions erected for the nobility in the reigns of Elizabeth and James I. It originated in the first attempt to revive classic architecture, influenced, no doubt, by Holbein, who was patronized by Henry VIII., and furnished several designs in this manner. John of Padua succeeded him, and built in the mixed style a palace for the Protector Somerset (for which purpose the cloisters of St. Paul's were taken down), and the mansion of Longleat for his secretary, Sir John Thynne. The vast dimensions of the apartments, the extreme length of the galleries, and enormous square windows, are the leading

Holland House.

characteristics of this manner of building. The ornaments both within and without were cumbrous; nothing could exceed the heaviness of the cornices and ceilings wrought into compartments; in short, the architecture was in keeping with the dress of the period, rich and gorgeous, rather than elegant, graceful, and comfortable. The following examples of mansions of the 17th c. are still seen near London: Holland House, Campden House; and the following in Kent: Sir T. Willow's at Charlton, the Marquis of Salisbury's at Hatfield, and Knowle, the property of the Duke of Dorset. The most eminent architects of those times were John Thorpe, Gerard Christmas, Rodolph Symonds, and Thomas Holt.

ELIZABETHAN PERIOD: a name popularly given to that period of English history during which Elizabeth was queen (1533–1603). It is famous because, both in statesmanship and in letters, the genius of England

touched perhaps its highest mark. Politically, with the aid of her great ministers, Cecil, Walsingham and Burghley, the royal power was consolidated and the power of the nation was made effective both at home and abroad. In war Spain was humiliated by the crushing of the great Armada. By an alliance with the Protestant powers of the Continent, Elizabeth became the head of those states whose policy was parallel with hers. She quelled rebellion at home and caused the enactment of wise laws, stimulated trade, chartered great companies, among them the East India Company, made the people prosperous and contented, and began that expansion of English rule through colonization in the Western Hemisphere which was destined to make of England a great world empire. See FROBISHER; DRAKE; RALEIGH.

In literature, the Elizabethan Period was made glorious by the genius of Spenser, Shakespeare, and Bacon, and by that brilliant galaxy of dramatists among whom the names of Beaumont and Fletcher, Massinger, Ford, and Webster, are the most famous together with that of Ben Johnson, whose finest works rival even those of Shakespeare. In history, the chroniclers, John Stow and Sir Walter Raleigh, are conspicuous; in the records of geographical exploration one notes Hakluyt and Davis; and in theological writing, Richard Hooker still remains one of the most remarkable logicians and expositors as well as a master of vigorous and lucid English. See ENGLISH LITERATURE.

ELIZABETH, Austrian empress: b. 1837, Dec. 24; d. 1898, Sep. 10. She was the daughter of Duke Maximilian Josef of Bavaria, and married her cousin the emperor Franz Joseph on 1854, Apr. 24. They were crowned together on the inauguration of the Austro-Hungarian empire. While visiting Geneva she was assassinated by an Italian anarchist.

ELIZABETH, *e-lĭz'a-bĕth*, English queen: 1533, Sep. 7—1603. Mar. 24 (reigned 1558—1603): daughter of Henry VIII. and the unfortunate Anne Boleyn. While she was in her third year, her mother was beheaded. Afterward Elizabeth was sent to the country, where, in comparative poverty and seclusion, under the care of ladies who leaned to the 'new learning,' and sometimes, though seldom, with the companionship of her brother Edward, or her sister Mary, the greater part of her early youth was spent. When Catharine Parr became queen, Elizabeth, who was a favorite with her, was more seen at court; but from some unknown cause, she incurred her father's displeasure, and was again sent to the country. Her father died when she was 13 years old. During the reign of her brother Edward, her life passed quietly and peacefully. She was then remarkable for a great demureness and sobriety of manner, discoursing with her elders with all the gravity of advanced years. Edward used to speak of her as his 'sweet sister Temperance.' During her

sister's reign, this demureness was exaggerated into prudery, and the vanity which, in after-years, with ampler means at its command, displayed itself in the utmost profusion of personal decoration, then sought for distinction by excess of plainness. Her Protestantism, and the way in which court was paid to her by the Prot. nobility, caused uneasiness to Mary and her council. On her sister's command, she conformed to papacy, but the insincerity of the conformity deceived no one. Upon the pretext of having been concerned in Wyatt's rebellion, she was sent 1554 to the Tower. She entered it with all the gloomy forebodings which the fate of so many royal ladies who had been recently within its walls, could suggest. In daily fear for her life, many months passed. Indeed, the warrant for her execution was at one time prepared; and it is unquestionable that the stern bigotry of Mary and her councilors, Gardiner and Bonner, would have sacrificed Elizabeth, but for the fear of popular commotion. The people, however, regarded Elizabeth with great favor, and many already looked forward to the time when the death of Mary should free the court from foreign influence, and give room for a milder government. Thus the life of Elizabeth was saved, but for some time longer she was kept a prisoner at Woodstock. During the remainder of Mary's reign, Elizabeth, though occasionally at court, resided chiefly at her residence of Hatfield House, in Hertfordshire, where she occupied herself with feminine amusements, and the study of classical literature, under the learned Roger Ascham.

When Mary died (1558, Nov. 17), Elizabeth was 25 years of age. Her accession was welcomed alike by Rom. Catholic and Protestant. The former were, outwardly at least, the majority in Mary's reign; but among them there were few who really cared for the peculiar doctrines of the Roman Church, and there were many who were weary of priestly interference, foreign dictation, and cruel persecution. Like Elizabeth herself, there were many who had conformed merely to save themselves from trouble. They had obeyed the Six Articles in Henry's time; had agreed to the Prot. settlement of Edward; had turned with Queen Mary, and were now ready to turn again with Queen Elizabeth. The Protestants, of course, who had never believed the sincerity of Elizabeth's conformity, welcomed her to the throne. Elizabeth then began, amid dangers and difficulties, a reign which, contrary to the expectation of all, was of unexampled length and prosperity. It would be wrong not to attribute to her influence some effect in producing the great changes in England during the next 44 years; but so far as these changes were not produced in the natural course of the development of the nation's powers, and so far as they bear the mark of an individual mind, they bear much more the impress of the bold yet cautious judgment and clear intellect of the great minister, Cecil, than of the sovereign's will. It is to the highest praise of Elizabeth

that her first act on succeeding was to consult with such a man, and that to the very last she could bend her capricious temper to his control.

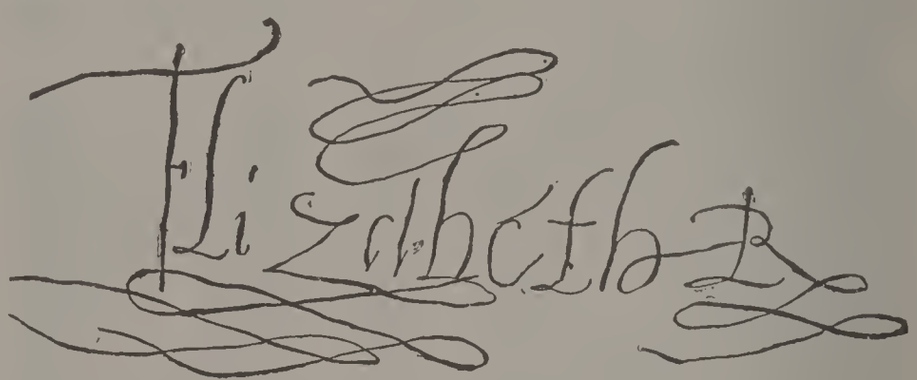
How the government influence was to be directed, was not long in being shown. Till parliament should meet Elizabeth issued a proclamation that the English language should be used in the greater part of the church service, and that the Host should not be elevated by the priest during mass. This sufficiently indicated into what hands power had passed, and was enough to throw the mass of the indifferent to the side of the Protestants, and to cause a Prot. majority to be returned to Elizabeth's first parliament. The acts of this parliament must be ever memorable in English history. It was then that England took its position as a Protestant power. The Book of Common Prayer, retaining, doubtless, some mixture of medieval thought, but vivid with new energy, was appointed to be used in all churches; the Thirty-nine Articles were settled as the national faith; the queen was declared to be head of the church. Thus all allegiance to Rome was thrown off. This revolution was soon accomplished, and with little turmoil. The bishops, with one exception, refused to conform; but as a sign of the times, marking how thoroughly the priesthood must have become demoralized before their power was lost, it is noteworthy that of the 9,000 clergymen who held livings in England, there were fewer than 200 who resigned, rather than obey the new order of things.

The policy of Elizabeth's ministers was one of peace and economy. They found the nation at war with France and Scotland, and one of their first acts was to secure peace upon favorable terms. Ever afterward, they followed the same path. No war was undertaken in her reign for the sake of territorial conquest. To strengthen her own throne Elizabeth secretly succored the Protestants in Scotland, in France, and in the Low Countries; but she had few open wars. To be at peace with a government, nay, apparently to be upon the most amicable of terms with it (as Elizabeth was with the French court, while she sent assistance to the Huguenots at Rochelle), and at the same time to aid its rebellious subjects, was in those days thought only part of the politic dissimulation without which, it was believed, no nation could be safely ruled. To maintain the security of her own throne, and to prevent foreign interference in English matters, was the mainspring of Elizabeth's foreign policy; and she lost no opportunity of weakening and finding occupation abroad for any foreign power that unduly threatened her authority.

The one great blunder of England's policy was the treatment of Mary Queen of Scots. Had Elizabeth pursued a straightforward course, when her rival was thrown into her hands, much evil might have been spared. Some of the English ministers were prepared to take effectual measures to remove a life which might be turned into so dan-

gerous a tool in the hands of Rom. Catholics. Elizabeth shrank from that course, but had not the courage and generosity to set Queen Mary at liberty. Had this course been taken, Mary would have gone to France or Spain, would have made a foreign marriage, and as a foreigner would have lost the only sources of her real power—the sympathies of the Scotch and English Rom. Catholics. As it was, Elizabeth retained her a prisoner, and thus for years gave cause to conspiracy after conspiracy among the English Rom. Catholics. For a rebellion incited to set Mary free, the richest and most popular of the English nobility, Norfolk, was put to death. The discovery of every new plot led to demands, on the part of parliament, for the death of Mary. The plots then took a graver aspect. The assassination of Elizabeth, and the placing of Mary on her throne, became the object. On the discovery of Babington's conspiracy for this purpose, the popular cry was irresistible, and was joined in by Cecil and Walsingham, and others of Elizabeth's ministers, who had sinned too deeply against Mary to run the risk of her succession to the throne. With reluctance and hesitation, the sincerity of which need not be questioned, Elizabeth consented; and Mary, after long years of confinement, was condemned and beheaded.

This led to new evils. The participation of the Rom. Cath. party in the plots was retaliated by persecution.



Fac-simile of Queen Elizabeth's Signature.

Many suffered under an act passed 1585, making it treason for a Rom. Cath. priest to be in England, and felony to harbor one. These cruel measures were the ultimate means of bringing upon England the most menacing foreign attack which she had suffered. Philip of Spain had long meditated vengeance against England. The greatest state in Europe, enriched by splendid acquisitions in the new world, could ill brook that a power of the second rank should incite rebellion among her subjects in the Netherlands, should aid the Protestants in their desperate struggle against Alva, and allow its ships (little better than pirates, it must be confessed) to enter the Spanish harbors, and cut out the rich laden galloons. These were the real reasons: to restore the Rom. Cath. faith, and to revenge the death of a Rom. Cath. queen, furnished osten-

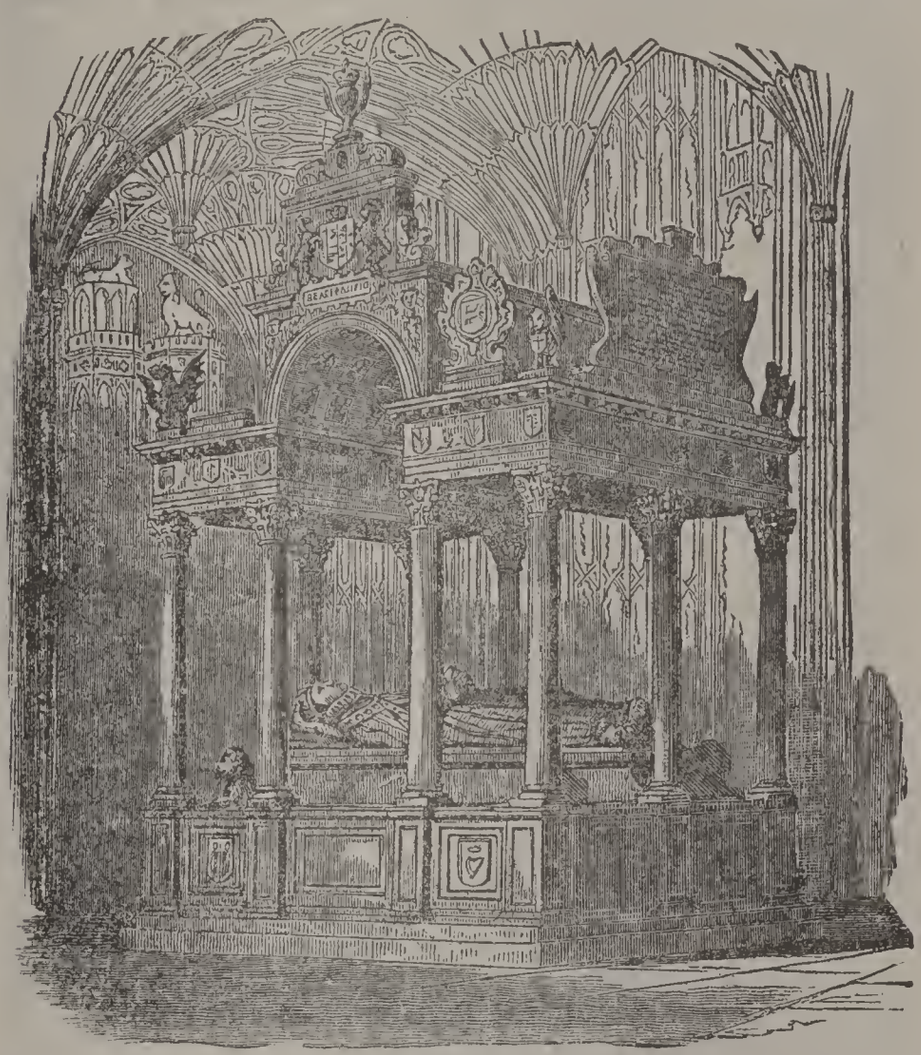
sible reasons. Years had been spent in preparation. In 1588, the 'Invincible Armada' sailed from the Tagus, manned by 8,000 sailors, and carrying 20,000 soldiers. To aid these, a land-army of 160,000 men was to be transported from the Netherlands under the Duke of Parma. The news roused all England, and every man who could carry arms—Prot. and Rom. Cath. from 18 years of age to 60—was enrolled in the forces. The old queen herself rode at Tilbury, energetically encouraging the army. A fleet of 200 vessels and 15,000 seamen gathered itself on the s. coasts, and waited the attack. Superior skill and courage gained the victory for the English; and what these had begun, the force of the elements completed. The splendid Armada was broken and destroyed before it could join the land-army, not a soldier of which ever left foreign ground; while not a seaman of the fleet, save those whom shipwrecks sent, ever set foot on English ground.

Elizabeth died nearly 70 years of age, having reigned nearly 45 years. If the life of her rival, Mary of Scotland, read somewhat like a tragedy, the private life of Elizabeth might afford abundant materials for comedy. Always parading her wish to live an unmarried life, Elizabeth coquetted with suitor after suitor till long after that period of life when such proposals verge upon the ridiculous. Of her father's schemes to marry her to the Scotch Earl of Arran or to Philip the son of Charles V.—afterward husband of Mary—it is unnecessary to speak, for Elizabeth had personally little to say in regard to them. But she was scarcely more than a child when her flirtations with the handsome Lord Admiral Seymour—brother of the Protector Somerset—had passed the bounds of decorum. In Mary's reign, Elizabeth was flattered with the attentions of her kinsman, the Earl of Courtenay, and she declined the hand of Philibert of Savoy, pressed on by her sister's council. When queen, with some hesitation she refused the offer of Philip II., who was desirous of perpetuating his influence over England, and she began that connection with Leicester, which so seriously compromised her character. It is certain that she loaded him with honors so soon as she had them to bestow; allowed him to become a suitor for her hand within a few days after the sudden death of his wife, Amy Robsart, attributed by all England to his agency; and allowed him to remain a suitor long after his open profligacy had disgusted the nation, and had even opened her own eyes to his worthlessness. If we credit the scandal of the times, the intimacy was of the most discreditable kind. If we credit those sources of information, recently turned to more profit by Mr. Froude than by any of his predecessors, which are found in the dispatches of the bp. of Aquila, ambassador of Philip II. in London, preserved in the archives of Simancas, not only was the moral character of Elizabeth sullied with the darkest crimes, but even the quality for which she has ever been most honored, her English patriotism, was mere affectation. These dispatches represent

her as accessory—at least, after the fact—to the murder of Amy Robsart, and as offering to Spain to become Rom. Catholic, and to restore the Spanish ascendency in England, if Philip would support her on the throne as the wife of Leicester; and they represent her as being restrained from giving way to the fatal consequences of her wild passion only by Cecil's control. That there is some basis of truth in this revelation, it is scarcely possible to deny; but the hatred with which Philip regarded Elizabeth, after her refusal to marry him, has undoubtedly led the courtly bishop to gross exaggerations. It is undeniable, however, that had Elizabeth followed her own inclinations, she would have married Leicester. Her ministers, wisely for the nation, prevented this, but Elizabeth never seriously entertained another proposal. Cecil could prevent her marrying whom he would not, but he could not bring her to marry whom he would. Among less distinguished suitors, the Archduke Charles of Vienna, and Prince Eric of Sweden pressed their suit in vain. Petitions from parliament to the queen to marry, only excited her maidenly wrath, and produced dignified replies that she would attend to the matter when the time came. Years passed on, and she remained a spinster. Catherine of Medici, queen-mother of France, intrigued to marry her to one of her sons, Henry of Anjou (afterward Henry III.,) or the Duke of Alençon, afterward Duke of Anjou. When the foreign envoys pressed the suit of the latter, Elizabeth was 38 years of age, and her suitor 19; but they ingeniously flattered her that she and he looked of the same age, for she, by her good preservation, looked nine years younger than she was; while the Duke, by his wisdom, gravity, and mature intellect, looked nine years older. This flattery with more plausible attractions, was without effect.

Elizabeth's position gave too much scope for the development of the unamiable and ridiculous features of her character. The personal vanity displayed in her extravagant dress, her conversation, her 'high and disposed' dancing, excites a smile, not lessened when we read of the irritable mistress boxing the ears of her councilors, cuffing her attendants, indulging in expressive masculine oaths, and amusing herself with rough masculine sports. The assertion that she was of a cruel disposition is false. That she could do cruel things when her vanity was concerned is sufficiently attested by her ordering the right hand of a barrister, named Stubbes, to be struck off for writing a remonstrance against her marriage with the Duke of of Alençon, which she thought unduly reflected on herself; but in her reign, the reckless waste of human life which marked the reigns of her predecessors was unknown. She was not, however, of fine feelings. Her brother could compliment her on the calm mind and elegant sentences with which she replied to the communication of the death of her father. On the news of her sister's death, she burst out with rhapsodical quotations from the Psalms; and when she heard of the execution of the death sentence

on her lover Seymour, she turned away the subject with something like a jest. By her attendants, she was more feared than loved. The one quality which never failed her, was personal courage; and when she chose, her demeanor was stately and royal. Religion was with her, as with a great proportion of the nation at that time, a matter more of policy and convenience than of feeling or principle. She preferred Protestantism, from early associations, because it gave her the headship of the church, freed her from foreign interference, and was more acceptable to her ministers and to the nation. But she



Queen Elizabeth's Tomb:

In the North Aisle of Henry VII.'s Chapel, Westminster Abbey.

had conformed in Mary's time to Rom. Catholicism with little difficulty; and, had there been necessity for it, she would rather have reigned a Rom. Cath. than not have reigned at all. To the last, she retained in her private chapel much of the ritualism of the Roman Church; and while refusing her Rom. Cath. subjects the exercise of their religion; she entertained the addresses of Rom. Catholic suitors. How thoroughly incapable she was of appreciating a matter of religious principle may be gathered

from the fact, that she looked upon the deep Puritan movement, destined soon afterward to take so important a part in the nation's development, as some frivolous controversy about the shape of clerical vestments. Of toleration, then well enough understood by Bacon and the more advanced spirits of the age, she had no conception.

What makes the name of Elizabeth so famous, was the splendor of her times. In her long reign, the true greatness of England began. Freed from the possession of those French provinces which rather harassed than enriched—with little domestic commotion—with no great foreign wars—with an almost complete immunity from religious persecution, the nation turned to the arts of peace. An unequalled literature arose. The age that produced Spenser, Shakespeare, and Bacon, could not be other than famous. Under Frobisher and Drake, maritime adventure began, and the foundations of British naval force were laid. Commerce, from being a small matter in the hands of a few foreign merchants, developed itself largely. The Exchange of London was opened in Elizabeth's time; and in the charter which she granted to that company of merchant adventurers, which afterward took the name of the East India Company, may be seen one of the small beginnings of a vast colonial empire. The social condition of the people also greatly improved in her reign. The crowds of vagabonds which the monastic institutions had fostered, and who had pillaged the country in all ways on the secularization of the monastic property, died out, or were absorbed in industrious employments. The last traces of bondage disappeared. Simultaneously with the growth of greater comfort and intelligence in the people, parliament began to assert, with greater vigor, its constitutional rights. The right of the commons to free speech, and to initiate all money-bills, was steadily asserted; and the right of the crown to grant monopolies or to issue proclamations having the force of law, vigorously assailed. In the later years of her reign, the attempts of Elizabeth to gain arbitrary power, and her caprices, had forfeited the popularity which she so anxiously cultivated. But after her death, her fame revived; and during the time of the Stuarts, amid the jealousy of the Scotch, the troubles of the civil wars, and the hatred of a Rom. Cath. sovereign, the nation looked back with fond regard to the long reign of the 'Good Queen Bess,' when peace had prevailed, and the government had been thoroughly English.

ELIZABETH FARNESE, *fâr-nā′zĕ*, queen of Spain: b. 1692, Oct 25; d. 1766. She was a daughter of Edward II., Prince of Parma. On becoming the second wife of Philip V. she surprised those who had counseled the marriage by assuming the practical headship of the kingdom; her ambition and that of her minister, Alberoni, disturbed the whole of Europe.

ELIZABETH, Madame (Elisabeth Philippine Marie

HÉLÈNE), French princess: b. Versailles, 1764, May 3; d. Paris 1794, May 10. She was a sister of Louis XVI. She was the faithful friend and companion of the royal family in their flight to Varennes, and during their imprisonment was executed, on the pretense of corresponding with her other brothers, afterward Louis XVIII. and Charles X.

ELIZABETH, PAULINE OTTILIE LUISE, queen of Rumania: b. Neuwied, 1843, Dec. 29. She married Charles of Rumania, 1869, Nov. 15. She is well known as a writer over the signature 'CARMEN SYLVA,' her works including *Sappho* (1880); *Hammerstein* (1880); *Stürme* (1881); *Leidens Erdengang* ('Sorrow on Earth') (1882); *Les pensées d'une reine* (1882); *Pelesch Märchen* (1883); *Le pic aux regrets* (1884); *Es klopft* (1887); etc.

ELIZABETH PETROW'NA, empress of Russia: b. 1709, Dec. 29; d. 1762, Jan. 5. She was the daughter of Peter the Great and Catharine, and ascended the throne 1741, Dec. 7, as the result of a conspiracy, in which Ivan VI., a minor, who had reigned only one year, was deposed. Elizabeth is said to have rivaled her mother in beauty, and to have surpassed her in her love of pleasure. Her reign was stained both by her unbridled licentiousness and the tyranny of her government, which was conducted by favorites. Banishment to the mines of Siberia and imprisonment in dungeons were awarded for the slightest political offenses. She was a patron of literature, and corresponded with Voltaire, to whom she supplied materials for his *Life of Peter the Great*. She also founded the University of Moscow and the Academy of Fine Arts of St. Petersburg. Elizabeth sent an army, in 1748, to assist Maria Theresa in the war of the Succession, which contributed to bring about the Peace of Aix-la-Chapelle; and she joined in the Seven Years' war against Prussia.

ELIZ'ABETH, SAINT: 1207–1231, Nov. 19; b. Presburg; daughter of Andreas II., King of Hungary. At the age of four, she was affianced to the Landgraf of Thuringia, Louis IV., called the Pious, and brought to his court to be educated under the eyes of the parents of her future husband. She early showed what may be called a passion for the severities of the Christian life, as it was conceived in those days. She despised pomp, avarice, ambition; cultivated humility, and exhibited the most self-denying benevolence. Her conduct, even as a girl, astonished the Thuringian court; but such was the grace and sweetness of her disposition, and the excellence of her beauty, that Louis—though her affections seemed to be given wholly to God—still wished to marry her. They were united when Elizabeth was only 14. Louis himself, far from blaming the devout girl whom he had made his wife for her long prayers and ceaseless almsgiving, was himself partially attracted to a similar mode of life. A boy and two girls were the fruit of their union; but the happiness of Elizabeth, so far as it depended on anything earthly, was shattered

by the death of her husband 1227, when absent on the crusade headed by Barbarossa. Her confessor, Conrad of Marburg, a narrow fanatical monk (to whose miserable teaching Elizabeth mainly owed her perverted idea of life and duty), had trained her to stifle the emotions of her nature as sinful, and the poor widow hardly dared to bewail her loss. Great misfortunes soon befell her. She was deprived of her regency by the brother of her deceased husband, and driven out of her dominions on the plea that she wasted the treasures of the state by her charities. The inhabitants of Marburg, whose miseries she had frequently relieved, refused her an asylum, for fear of the new regent. At last she found refuge in a church, where her first offering of duty was to thank God that he had judged her worthy to suffer. Subsequently, after other severe privations, such as being forced to take up her abode in the stable of a hostelry, she was received into the monastry of Kitzingen by the abbess, who was her aunt. When the warriors who had attended her husband in the crusade returned from the East, she gathered them round her, and recounted her sufferings. Steps were taken to restore to the unfortunate princess her sovereign rights. She declined the regency, however, and would accept only the revenues which accrued to her as landgravine. The remainder of her days were devoted to incessant devotions, almsgivings, mortifications, etc. There is something mournfully sublime in her unnatural self-sacrifice. We read of this beautiful tender-hearted creature washing the head and feet of the scrofulous and the leprous, and Murillo has a painting (now in the Museum at Madrid) of this act of devotion. The solemn tragedy of her brief life assumed toward its close a ghastly intensity through the conduct of her confessor, Conrad, who, under pretence of spiritual chastisement, used to strike and maltreat her with brutal severity. The alleged cause of this was Conrad's aversion to her 'squandering' her money among the poor. Perhaps he thought it should have gone to *him*. At last her health gave way; and, at the age of 24, Elizabeth died, victim partly of ill-usage and partly of a mistaken theory of religious life, but as gentle and saintly a soul as figures in the history of the middle ages. She was canonized four years after her death. See Montalembert's *Historie de Sainte Elisabeth de Hongrie* (Paris 1836). The Rev. Charles Kingsley's dramatic poem, entitled *The Saint's Tragedy* (London 1848), is founded on the story of Elizabeth's life.

ELIZABETH STUART, queen of Bohemia: b. Falkland Palace, Fifeshire, 1596, Aug. 16; d. London, 1662, Feb. 13. She was a daughter of James I. of England, and was married to the Palatine Frederick at Whitehall, 1613, Feb. 14. Her husband was then at the head of the Protestant interests in Germany, and in 1619 he accepted the crown of Bohemia offered to him by the revolted Protestants of that country. This he was only able to retain for a very short period; and after his defeat by the

Imperialists at the battle of Prague in 1620, he and his wife were obliged to flee, first to Breslau and Berlin, and then to The Hague. Elizabeth had 13 children, several of whom died early. Charles Louis, the eldest surviving, was reinstated in the palatinate by the Treaty of Westphalia in 1648. His daughter, Elizabeth Charlotte, was the second wife of Philip, Duke of Orleans, brother of Louis XIV. Her descendants were excluded by their Catholicism from the crown of England, but one of them was regent of France during the minority of Louis XV.; and another, Louis Philippe, ascended the throne after the revolution of 1830. Her sons, Princes Rupert and Maurice, distinguished themselves in the civil war in England. Her daughter, Sophia, married into the house of Brunswick, became electress of Hanover, and mother of George I. Elizabeth Stuart's cause was extremely popular with the English nation, and after her husband was deprived of the crown of Bohemia she still retained among them the endearing epithet of 'Queen of Hearts.' She returned to England at the Restoration with her nephew, Charles II.

ELIZABETH OF VALOIS, *vä-lwä*, or ISABELLA, queen of Spain: b. Fontainebleau, France, 1545, Nov. 22; d. Madrid, 1568, Oct. 3. She was a daughter of Henry II., of France, and Catharine de Medici. She was destined to be the wife of the infante, Don Carlos, but his father, Philip II., being left a widower, became fascinated and married her himself. The story of a romantic relationship between Elizabeth and Don Carlos has furnished tragic subjects to Otway, Campistron, Chénier, Schiller, and Alfieri.

ELIZ'ABETH, New Jersey: city, capital of Union co., on Newark Bay and the Arthur Kill; and on the Pennsylvania, Lehigh Valley, Baltimore & Ohio, Philadelphia & Reading, and New Jersey Central railroads; 14 m. s.w. of New York. It is also connected with important commercial points by steamboats and sailing vessels. The city is lighted with gas and electricity. Its chief articles of manufacture are, sewing-machines (one of the shops of the Singer Manufacturing Company, employing about 10,000 men, being located here), oil-cloth, hats, saws, mill-machinery, stoves, hardware, edge tools, harness, cordage, and combs. The shops of the N. J. Cent. railroad, employing about 1,000 men, and the Crescent Steel Works and shipyard are located here. A large business is done in the shipment of anthracite coal. There are three national banks, a savings bank, and a trust company, with a combined capital of $700,000 and deposits of $7,154,000; also building and loan associations. Among the public institutions are the Alexian Brothers Hospital, General Hospital, St. Elizabeth Hospital, Orphan Asylum, Old Ladies' Home, and Public Library. The educational institutions include the Battin and Pingry high schools, the Vail-Deane School, a business college, and 11 public schools. There are many handsome churches, and an old tavern

where Washington stopped on his way to New York to his first inauguration; also the home of Gen. Winfield Scott, the Boudinot house, and the old Livingston mansion. The form of government is by mayor and city council of 24 members, elected biennially. In 1873–82 Elizabeth experienced serious financial troubles. Before the panic of that time speculators and wooden pavement companies formed themselves into rings, bought property on the outskirts of the city, made themselves freeholders, and demanded of the council the opening of streets which that body had no right to refuse. Millions of dollars were borrowed and other millions laid upon the vacant land in the shape of assessments, that could not be paid when the panic came. On 1879, Feb. 1, when the city suspended payment of interest, the debt amounted to $5,638,000, and the assessed valuation to $11,412,118. Negotiations for a settlement of the debt were begun 1880. In 1902, Mar. 1, the bonded debt including unadjusted bonds was $3,267,840; the sinking fund $3,453; the net debt $3,264,387. Total assessed valuation for 1902 was $20,168,000. Elizabeth was settled first by a company of whites from L. I., who bought land on Elizabeth river from the Indians, 1665. In the summer of the same year Capt. Philip Carteret, bearing a governor's commission from Sir George Carteret to the whole region between the Hudson and Delaware rivers, known then as *Nova Cæsarea*, arrived there, and named the place Elizabeth Town. It became immediately the seat of govt. The first Gen. Assembly of N. J. convened there 1668, the first trial by jury occurred 1671, the settlement was incorporated 1740, the College of New Jersey (afterward removed to Princeton) was established there 1747, and Elizabeth remained the cap. of the state till 1790. Pop. (1900) 52,130; (1910) 73,409.

ELIZ'ABETH ISLANDS: cluster of 16 small islands off the coast of Mass., between Buzzard's Bay and Vineyard Sound, constituting the township of Gosnold in Dukes co. The principal ones are Naushon, Nashawena, Pasque, Cuttyhunk, Nonamesset, Uncatena, and Penikese. Naushon has been occupied as a summer residence for many years; Nashawena, Pasque, and Cuttyhunk are occupied in summer by New York clubs for yachting and fishing purposes; and Penikese was given by John Anderson with all its buildings and an endowment of $50,000 to Prof. Louis Agassis for the establishment of a summer school of natural history, 1873; this school has been discontinued. The Elizabeth Islands were discovered by Bartholomew Gosnold, who founded a colony on Cuttyhunk, 1602.

ELIZABETHTOWN, Ky.: city, county-seat of Hardin county; on the Louisville & N., and the Illinois C. R.R.'s; about 40 miles south of Louisville. The city is the centre of the trade in asphalt for which the county is noted, and it does a large business in live stock and agricultural products. Pop. 2,100.

ELIZABETHTOWN, N. Y.: village, county-seat of

Essex County; on the Bouquet River, 12 miles west of Westport, the nearest railroad station. Westport is on Lake Champlain and on the Delaware & Hudson Railroad. Elizabethtown is in the Adirondacks, on a height overlooking several beautiful valleys. It is a famous summer resort, and has quite a population in July and August. Pop. (1900) 491; (1910) 505.

ELIZABETOPOL, *ā-lē-zâ-vā-tō'pol:* govt. of Russia, in Transcaucasia; part of the former kingdom of Georgia; bounded on the n. by Tiflis, on the e. by Baku, on the s. by Persia, on the w. by Erivan; 17,038 sq. m. The surface is mountainous in the w., level in the e., and is watered by Kur river and many small streams. Inhabitants chiefly Tatars and Armenians. Cap. Elizabetopol. Pop. of province, 889,000; of capital, 20,000.

ELK, n. *ĕlk* [AS. *elch;* Sw. *elg;* Icel. *elgr,* and elk], called also Moose, or Moose-Deer (*Alce alces,* var. *Americanus*): largest living species of the *Cervidæ,* or deer family; native of the n. parts of Europe, Asia, and America. When full grown, it is about six ft. in height at the shoulders, and sometimes weighs 1,200 lbs. The body is round, compact, and short; the neck is short and thick, unlike that of deer in general, but thus adapted for sustaining the great weight of the head and horns. The head is very large, narrow, about two ft. long. The horns in males of the second year are unbranched, not flattened, and about a foot long; as the animal becomes older, they begin to display a blade, with more numerous snags, and in mature elks the blade becomes very broad, the snag sometimes 14 on each horn; a single antler has been known to weigh about 60 lbs. The horns have no basal snag projecting forward. The ears are long, and have been compared to those of the ass. The eyes are small. The limbs are long, and very graceful. The tail is only about four inches long. The body is covered with coarse angular hair, which breaks when bent. On the neck and withers there is a heavy mane, and the throat is covered with long hair. A large goitre-like swelling under the throat of the younger elks has a very curious appearance. The hoofs of the elk, like those of the reindeer and of the buffalo, are so constructed as to part widely, and to afford a better footing on soft marshy ground or on snow; they make a clattering when it runs. In running, it carries its muzzle forward, with the horns thrown back upon the neck, so that they may not be caught by branches. Its shoulders being higher than the croup, its common gait is a shambling trot; but it can also gallop with great rapidity. The color of the elk is brownish black, darker in winter than in summer; the limbs, the sides of the head, and the mane are of a lighter color than the body. Elks are seen sometimes in small herds, but often singly; they are now very rare in Europe, and are no longer found in parts of N. America in which they were formerly common. They formerly extended as far south as the Ohio. They

are seen sometimes even on the shores of the Arctic Ocean. They delight in marshy districts and in forests. When compelled to eat grass, they must kneel to reach it: their proper food consists of the branches and foliage of shrubs and trees. They are very timid and inoffensive, except during the rutting season. A single stroke of an elk's fore-foot is sufficient to kill the strongest dog. It is also an extremely wary animal, and is with the greatest difficulty approached by the hunter. Its sense of smell is very acute, and the slightest sound excites its alarm. It is greatly prized as game, and sought after in N. America. In Sweden, its destruction is prohibited; and in Norway is placed under legal restrictions. The flesh of the elk is esteemed a good kind of venison; the fat is remarkably soft; the nose and the tongue are reckoned delicacies. The skin is used for a variety of purposes.

The elk is easily domesticated, and was at one time employed in Sweden for conveying couriers, being capable of travelling more than 200 m. in a day when attached to a sledge.

The elk of Ceylon is a deer of the group to which the name *Rusa* has been given.

ELK, Irish (*Megaceros Hibernicus*): large deer whose remains are found in the Quaternary beds, where an American species is found of equal size. It is a true deer, between the fallow and reindeer, and though abundant in Ireland, it is not peculiar to that country, being found also in England, Scotland, and on the continent of Europe. In Ireland, it occurs in the shell marl underlying the extensive turbaries. In England, lacustrine deposits and brick-clay contain its remains, and, associated with the mammoth and rhinoceros, they are found also in ossiferous caves. The most striking feature in this animal was its enormous antlers. A straight line drawn between their extreme tips in one specimen measured ten ft. ten inches. The form of the antler differs from that of any living species of deer. The beam enlarges and flattens into a palm; a brow snag exists as in the fallow-deer, but in adult specimens this bifurcates and expands somewhat as in the reindeer—a peculiarity never observed in the fallow-deer group. The antler is furnished also with a back snag. Some idea of the enormous size and weight of the antlers may be formed from the fact that, in a specimen where the head weighed 5¼ lbs., their weight was 81 lbs. To sustain this, the vertebræ of the neck and the limbs are very much larger and stronger than in any other deer.

ELKESAITES: see Elcesaites.

EL-KHARGEH, *ĕl-kâr'gé:* capital of the Great Oasis, Upper Egypt, lat. 25° 28′ n., long. 30° 50′ e. In the vicinity of the town are numerous ruins, among which are those of a temple; there is also a remarkable necropolis. Pop. 6,000.

ELKHART, *ĕlk'hârt:* city of Elkhart co., Ind.; on the

Elkhart river; at the confluence of the St. Joseph river, and on the Lake Shore and Michigan Southern and the Cleveland, Cincinnati, Chicago and St. Louis railroads, 100 m. e. of Chicago. It is a busy railroad and traffic centre for an extensive farming region, and contains the principal construction and repair shops of the Lake Shore company, machine shops, flour and starch mills, horn, brass, carriage, musical instruments, chewing gum, bicycle, and other factories, the rivers affording excellent water power. The Elkhart Institute is the chief of many good educational institutions, and Elkhart has public school and Carnegie libraries, parks, gas and electric lighting, street railroads, waterworks, etc. Pop. (1900) 15,184; (1910) 19,282.

ELKIN, William Lewis, American astronomer: b. New Orleans, 1855, April 29. He was educated at the Royal Polytechnic School in Stuttgart, Germany, and was graduated in 1880 at the University of Strasburg. He then went to the Cape of Good Hope on the invitation of Sir David Gill, English astronomer there, and took part with him in observations with the heliometer for the determination of stellar parallax, these determinations being the most accurate of the kind ever made up to that time. He became astronomer at the Yale College observatory in 1884, where he has continued his excellent work in stellar parallax.

ELKINS, Stephen Benton, American politician: b. Parry County, Ohio, 1841, Sept. 26. He removed to Missouri when a child; was graduated at the University of Missouri in 1860; and admitted to the bar in 1863. During the latter year he went to New Mexico, where he was a member of the Territorial legislature in 1864–5; and the Territorial delegate in Congress in 1873–7. Subsequently he removed to West Virginia, and became interested in railroads and coal mining. In 1891–3 he was secretary of war, and in 1894 was elected to the United States Senate. He was re-elected in 1900 and 1907.

ELKS, Benevolent and Protective Order of, a convivial, charitable, and benevolent organization founded by members of the theatrical profession in New York in 1868, but now admitting to membership men in other professions and occupations. The order has one grand lodge and 820 sub-lodges throughout the country. The membership in the United States (1903) numbered more than 130,000, including many prominent men. Though not a beneficial order, it is claimed that it expends more in unostentatious charity than any other organization in the world. The benefits disbursed since organization amount to $1,250,000, with an annual average distribution at present of upward of $150,000.

ELL, n. *ĕl* [AS. *eln;* Dut. *el;* Icel. *alin*, the arm from the elbow to the tip of the middle finger, an ell: Dan. *alen;* Ger. *elle*, an ell: Gr. *ōlĕnē;* L. *ulna*, the forearm: F. *aulne*, an ell-measure (allied to elbow: comp. Gael.

uillean, an elbow]: *originally*, the length of the whole arm from the end of the longest finger; the name of a measure of length for cloth, but not definite and now little used; an English ell is 45 inches or five-quarters of a yard (q.v.)—the Flemish, 27—the Scotch, 37. The Lat. *ulna* seems to have sometimes denoted also the measure between the outstretched hands. GIVE AN INCH AND HE'LL TAKE AN ELL, give a little, and he'll take more indefinitely.

ELLAGIC, a. *ĕl-lăj'ĭk* [F. *galle*, gall, reversed]: pertaining to or derived from gall-nuts. ELLAGIC-ACID, n. obtained by the action of oxidizing agents, as arsenic acid, iodine, water, etc., on gallic acid. It is obtained in largest quantity from the oriental bezoars. Pure ellagic acid is a light, pale yellow, tasteless, crystalline powder. It is insoluble in water, but soluble in alcohol. It was first obtained by Chevreul.

ELLAGITE, n. *ĕl'la-jīt:* one of the natrolite group, found in yellowish or brownish crystalline masses, pearly on the planes of cleavage.

ELLEBORINE, n. *ĕl-lĕb'or-ĭn* [L. *helleborus*, hellebore]: resin of extremely acrid taste, found in winter hellebore.

ELLENBOROUGH, *ĕl'ĕn-bŭr'rŭh*, Earl of (EDWARD LAW, first Earl of Ellenborough): 1790–1871, Dec. 2; son of the first baron (1750–1818, chief-justice of the king's bench). He was educated at Eton and St. John's College, Cambridge, where he graduated M.A. 1809; succeeded his father in the barony 1818; was lord privy seal in the Duke of Wellington's administration, 1828–29; president of the Board of Control during the short-lived Peel administration, 1834–35; and appointed on the return of Sir Robert Peel 1841, Sep. to the same office, which he relinquished a month afterward for the post of gov.gen. of India. He received the thanks of parliament 1843 for his 'ability and judgment' in supporting the military operations in Afghanistan. In many other respects his Indian administration was open to censure. He was charged with reserving his favor for the military, and inflicting undeserved slights upon the civil servants of the Company. He made showy progresses, addressed to the rulers and natives of India proclamations which appeared to sanction idolatry; and, finally, in his proclamation concerning the sandal-wood gates of the temple of Juggernaut, when brought back from Ghuznee, he reached the climax of a series of extravagances, which induced the directors of the East India Company to exercise a power used only in extreme cases, and to recall him. The ministry, however, stood by him, and he was created by the crown an earl and a viscount; he received also the distinction of G.C.B. In 1846, Sir Robert Peel made him first lord of the admiralty, an office which he resigned in July of the same year, at the disruption of the Peel administration. In the Derby administration of 1858 he was again minister for India, and the author of an

Indian bill which failed to obtain the sanction of parliament. Having permitted a dispatch to see the light, in which he had administered a severe and caustic rebuke to Viscount Canning, gov. gen. of India, an outcry was raised against him, which threatened the existence of the Derby government. To avert this result, Lord Ellenborough resigned. He afterward took a frequent and important part in the debates of the upper house. He was styled, by no less a judge than M. Guizot, 'the most brilliant of the tory orators.' He was twice married —first to a daughter of the Marquis of Londonderry, and secondly to the daughter of Admiral Digby. From the latter he was divorced. Ellenborough died without issue, 1871, Dec. 2, when the earldom and viscounty became extinct.

ELLENRIEDER, *ĕl'ėn-rē-dėr*, MARIE: 1791–1863, June; b. Constance: painter of high excellence. She studied in Munich, and 1820 went to Rome to perfect her knowledge of art. Her admiration of the old German masters gave a religious bent to her genius. On her return to Germany, she resided some time at Carlsruhe, where she painted a *Martyrdom of St. Stephen*, as an altar-piece for the Rom. Cath. Church. She was afterward appointed court-painter at Munich, but she chose to fix her residence at Constance, and gave herself exclusively to her profession. Among her principal pieces are the *Transfiguration of St. Barthelemy, Christ Blessing Little Children, Mary and the Infant Jesus, Joseph and the Infant Jesus, St. Cecilia, Faith, Hope and Charity,* and a *Madonna.* Marie Ellenrieder is reckoned in Germany as the greatest female artist of the present age. So full of ideal grace and beauty are the heads of her women and children, in particular, that it has been said that 'she seems to paint in the presence of angels;' her coloring, however, is gray, dull and sombre, like that which prevails among the old masters of the German school.

ELLERY, *ĕl'ėr-ĭ*, WILLIAM: 1727, Dec. 22—1820, Feb. 15; b. Newport: lawyer. He graduated at Harvard Univ. 1747; engaged in mercantile business and was naval officer of R. I.; studied law and began to practice 1770; and was chosen one of the delegates from R. I. to the continental congress, 1776, in which he signed the Declaration of Independence. Excepting 1780, '82 he served in congress till 1786; was a member of the board of admiralty; drew up the plan for the creation of the dept. of state; seconded Rufus King's motion for the abolition of slavery 1785; was commissioner of the loan-office of R. I. 1786, and chief justice of the superior court of R. I.; and was appointed collector of Newport, 1790, and held the office till his death.

ELLESMERE, *ĕlz'mēr:* town in the n.w. of Shropshire, England, near a beautiful lake or mere, 19 m. n.n.w. of Shrewsbury. It has considerable malting establishments. On the present site of a bowling-green once stood an an-

cient castle, alternately held by the English and Welsh. Pop. 1,800.

ELLESMERE, first Earl of (FRANCIS EGERTON): politician, patron of the arts, and author, 1800–57; second son of the first Duke of Sutherland. He graduated at Christ Church, Oxford, 1820; entered the house of commons, 1820, and represented successively Bletchingly, Sutherland county, and s. Lancashire; filled the office of chief-sec. for Ireland and then of sec. at war; in 1833 assumed the name of Lord Francis Egerton, in lieu of his patronymic Leveson-Gower. He achieved considerable literary distinction as a writer of graceful poems, translations from the German, etc. He also published a pamphlet on the defenseless state of the coasts of the metropolis, which called forth some adverse criticism. He was a munificent patron of the arts, and made many valuable additions to the collection of pictures which he inherited with the large estates of the last Duke of Bridgewater. He also built a noble gallery for their reception, which he liberally threw open to the public. After faithfully voting with the conservative party in parliament for a quarter of a century, he, on the retirement of the Peel administration, 1846, obtained a revival in his favor of the peerages of Ellesmere and Brackley. He died at his new mansion, Bridgewater House, London, and was succeeded in the Earldom by his eldest son, Viscount Brackley.

ELLET, *ĕl'ĕt*, CHARLES: 1810, Jan. 1—1862, June 21; b. Penn's Manor, Bucks co., Penn.: engineer. He studied engineering while employed in the construction of the Chesapeake and Ohio canal, and afterward in the Polytechnic School, Paris. He became chief engineer of the James River and Kanawha canal; built the first wire suspension bridge in the United States over the Schuylkill river in Philadelphia 1842; designed and built the railroad suspension bridges over the Niagara river below the falls 1847, and over the O. river at Wheeling W. Va.; improved the navigation of the Kanawha river; and assisted in laying out the Baltimore and O. railroad. At the beginning of the civil war he prepared plans for the construction of steel rams for river service, which were rejected by the navy dept. and adopted by the war dept.; was commissioned col. of engineers in the army; converted 9 river steamboats into a fleet of rams and with them defeated a Confederate squadron in the Mississippi river off Memphis 1862, June 6; and received a wound during the battle from which he died.

ELLICOTT, *ĕl'ĭ-kot*, ANDREW: 1754, Jan. 24—1820, Aug. 29; b. Bucks co., Penn.: engineer. He received a scientific and mechanical education; marked the boundaries of Va., Penn., and N. Y.; removed to Baltimore and was elected a member of the legislature: surveyed the land between Penn. and Lake Erie; and made, 1789, the first complete measurement of the Niagara river

with the height of the falls and the descent of the rapids. In 1790 he was commissioned to survey and lay out the city of Washington; 1792 was appointed surveyor-gen. of the United States; 1795 superintended the construction of Fort Erie; 1796 was commissioner to determine the boundary between the United States and the Spanish possessions on the south; and 1812 became prof. of mathematics in the U. S. Milit. Acad., and held the office till death. He conducted a series of astronomical observations in Montreal to carry out some provisions of the treaty of Ghent, 1817. He was a member of the American Philosophical Soc., a corresponding member of numerous scientific organizations, American and foreign, and an intimate friend of Washington, Franklin, Rittenhouse, and other fathers of the republic.

ELLICOTT, *ĕl'ĭ-kot*, CHARLES JOHN, Bishop of Gloucester and Bristol, England: b. 1819, Apr. 25, near Stamford, of which parish his father was rector. He studied at Cambridge, where he graduated 1841, and obtained many honors. He became prof. of divinity at King's College, London, 1848, and at Cambridge 1859. He was named Dean of Exeter 1861, and raised to the Episcopal bench 1863. He is best known as a commentator on the Epistles of the New Testament, and is distinguished for thoroughness of grammatical criticism.

ELLICOTT, HENRY J., American sculptor: b. near Ellicott City, Md., 1848; d. Washington, D. C., 1901, Feb. 11. His best-known works include bronze statues for the 1st and 2nd Pennsylvania Volunteers on the battlefield at Gettysburg, the equestrian statues of Gen. Hancock in Washington and Gen. McCellan in Philadelphia; and memorial monuments in various parts of the United States.

EL'LIOT, DANIEL GIRAUD, American zoologist: b. New York 1835, Mar. 7. He made zoology a special study from his youth; travelled in Europe, Africa, and parts of Asia in 1856–78; subsequently in Canada, Alaska, South America, and the greater part of the United States. He afterward became curator of zoology in the Field Columbian Museum. He has published: *The Pheasants; Birds of North America; The Grouse; Birds of Paradise; Hornbills;* etc. He has been decorated 10 times by various European governments for his researches in natural science.

ELLIOT, *ĕl'ĭ-ot*, EBENEZER, the CORN-LAW RHYMER: 1781, Mar. 7—1849, Dec. 1; b. Masborough, Yorkshire, England. His father was a man of strong character and narrow opinions, and, as appears from Ebenezer's Autobiography (published in the *Athenæum* 1850), exercised no little influence on his son's modes of thinking and sympathies. When a boy at school, Elliot was not a quick pupil; and even after his father had sent him to work in the iron-foundry where he himself held the situation of a clerk, the youth exhibited no fondness for read-

ing. Before long, however, he entirely changed, and began to study Milton, Shakespeare, Ossian, Junius, and other authors. His first published poem was composed in his 17th year; it is entitled *The Vernal Walk*. This was succeeded by *Night, Wharncliffe*, etc. In 1821, Elliot began business as an iron-founder on his own account at Sheffield. He was very successful; and in 1841 retired to an estate which he had purchased at Great Houghton, near Barnesley, where he died. Elliot's principal productions are *Love*, accompanied with a letter to Lord Byron, his famous *Corn-law Rhymes, The Ranter*, and *The Village Patriarch*, a work full of noble and earnest poetry, all of which appeared 1823–30. In 1834, he issued a collected edition of his works, 3 vols.; and in 1840, an edition in one volume. Elliot followed Crabbe, but with more depth and fire of feeling, in depicting the condition of the poor as miserable and oppressed, tracing most of the evils that he deplores to the social and political institutions of the country. The laws relating to the importation of corn were denounced by Elliot as specially oppressive, and he inveighed against them with a fevor of manner and a harshness of phraseology repulsive to ordinary minds. But the glow of earnestness kindles his verse, and hides a multitude of faults. More enduring, however, than his rhyming philippics are his descriptions of English, especially of Yorkshire scenery, and his delineations of humble virtue and affection. These are instinct with the purest spirit of poetry.

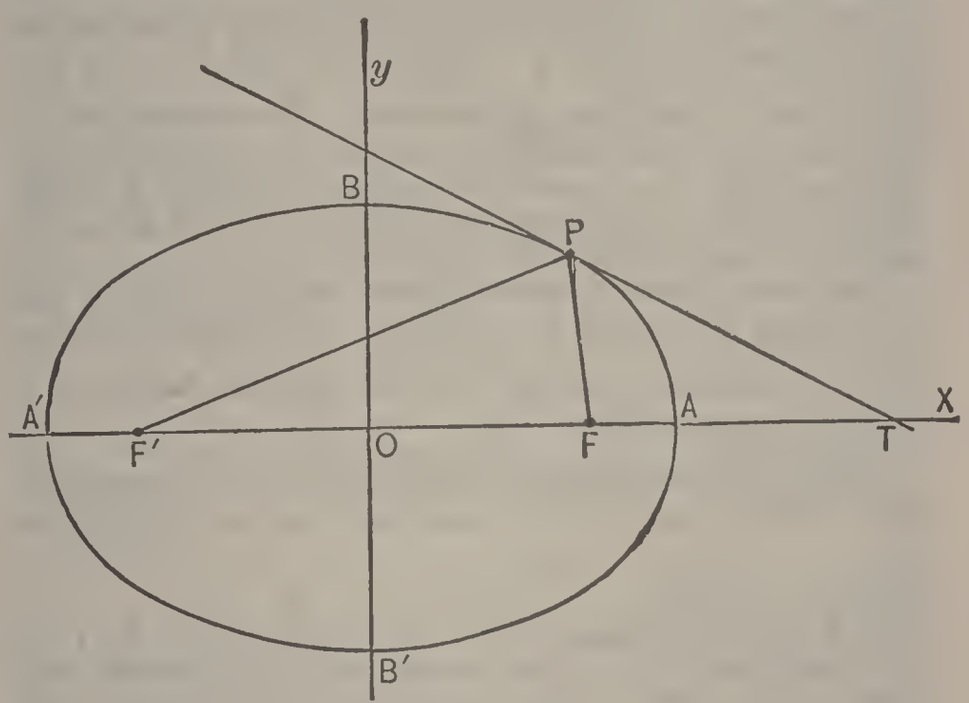
ELLIOTT, Charles Loring, American painter: b. Scipio, N. Y., December 1812; d. Albany, N. Y., 1868, Aug. 25. His works consist almost exclusively of portraits, many of which are of eminent American citizens, and are remarkable for the fidelity of the likeness and their vigorous coloring. In 1846 he became a member of the National Academy of Design.

ELLIOTT, Charlotte, English hymn-writer: b. 1789, March 17; d. Brighton 1871, Sep. 22. She wrote a number of religious poems, which were published under the titles: *Hymns for a Week; Hours of Sorrow; Invalids' Hymn Book*. The last collection included 'Just as I Am,' a hymn which is widely used, and has been translated into 'almost every living language.'

ELLIOTT, Jesse Duncan, American naval officer: b. Maryland 1782; d. 1845. He entered the United States navy as a midshipman 1804, and in October of 1812 won the first American naval success on the lakes, capturing two British brigs, the Detroit and the Caledonia, near Fort Erie. He commanded the Niagara, in the battles of Lake Erie, September 1813, being second in command to Perry, whom he succeeded in October of the same year as commander of the Lake Erie fleet. In 1815, during the war against Algiers, he was in command of the sloop of war Ontario, under Decatur, being appointed captain in 1818.

ELLIOTT, Maxine, American actress: b. Rockland, Me. Making her début with E. S. Willard, she played Felicia Umfraville in *The Middleman* (1890), and later in *The Professor's Love Story*. She was with Rose Coghlan, and in 1895 went to London with Augustin Daly's company. A member of N. C. Goodwin's company 1896, she played in Clyde Fitch's *Nathan Hale* (1898); was married to Mr. Goodwin that year, appeared with him in *When We Were Twenty-One*, and played Portia in the *Merchant of Venice* (1901).

ELLIPSE: a section of a right circular cone made by a plane which meets all the elements of the surface on the same side of the vertex, and at a finite distance from the vertex; or, it is a conic whose eccentricity is less than unity. Kinematically it is the locus of a point P which



moves so that the sum of its distances from two fixed points (F' and F), called foci, is constant. This property may be expressed by the equation $F'P+FP=2a$, where $2a$ is constant, and equal to the chord $A'A$ drawn through F' and F. The point O midway between the foci is called the centre; the line $A'A$ is called the major axis; the line $B'B$ through O perpendicular to $A'A$ is called the minor axis.

The ellipse is a curve of frequent occurrence in nature; e.g. an oblique section of a cylinder, the shadow of a circle, the curve on the concave side of the new moon are ellipses. But the most interesting and important examples are found in the orbits of the planets. These are all ellipses with the sun at one focus. This fact was first discovered by observation by the astronomer Kepler, about 1600 A.D. Later Newton proved theoretically that a body projected from any point in any direction, and

attracted by a central force which varies inversely as the square of the distance, will describe a conic section having the attracting force at one of the foci. Thus was Kepler's observations made to furnish a remarkable confirmation of Newton's law of gravitation.

The two lines $F'P$ and FP make equal angles with the line PT tangent to the curve at P. Whence it follows that rays of light emanating from one focus of an elliptic mirror will be reflected so that the reflected rays will all meet at the other focus. This is the reason why these points are called foci.

The easiest way to describe an ellipse is to fasten the two ends of a thread to pins at the foci, and then make a pencil move along the plane keeping the thread taut. The point of the pencil will trace an ellipse whose major axis is equal to the length of the thread.

The equation of the ellipse referred to its axes as axes of coordinates is $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, where 2a and 2b are the major and minor axes, respectively. The eccentricity e is given by $e=\sqrt{a^2-b^2}\div a=OF\div OA$, whence $e<1$. If $b=a$, then $e=0$, and the ellipse becomes a circle. Hence a circle may be considered as an ellipse whose eccentricity is zero, or whose foci coincide.

The polar equation of the ellipse with the pole at the centre may be written $r=\frac{b^2}{1-e^2\cos^2\theta}$. If the pole is taken at the left-hand focus the equation may be written $r=\frac{e}{1-e\cos\theta}$, where $l=b^2/a$.

The area of the ellipse is equal to πab. The length of the whole circumference is equal to $2\pi a(1-\frac{e^2}{2^2}-\frac{3e^4}{2^2.4^2}-\frac{3^2.5\ e^6}{2^2.4^2.6^2}-\ldots)$.

ELLIS, *ĕl'ĭs*, Alexander John, f.r.s., f.s.a.: b. Horton, England, 1814. He was educated at Shrewsbury, Eton, and Trinity College, Cambridge, taking his b.a. degree 1837. His name by birth was Sharpe, which was changed by royal license 1825. He was elected a Fellow of the Royal Soc. 1864, and of the Soc. of Antiquaries 1870. He was pres. of the Philological Soc. 1872–74, and is a member of the Philosophical and Mathematical Societies of London. Among his numerous and valuable works are: *Alphabet of Nature* (1845); *Essentials of Phonetics* (1848); *Universal Writing and Printing* (1856); *Early English Pronunciation* (1869–1871); *Practical Hints on the Quantitative Pronunciation of Latin* (1874); translation of Helmholtz's *Sensations of Tones as a Physiological Basis for the Theory of Music* (1875); contributions to *Chambers's Encyclopedia* (new edition).

ELLIS, *ĕl'ĭs*, George Edward, d.d., ll.d.: 1814, Aug. 8–1894, Dec. 20; b. Boston: educator. He graduated at Harvard Univ. 1833, and at its divinity school 1836, was ordained pastor of the Harvard Unitarian Church,

Charlestown, Mass., 1840, Mar. 11, and was prof. of systematic theol. in Harvard Divinity School 1857–63. He was a Lowell Institute lecturer on *Evidences of Christianity* 1864, on *Provincial History of Massachusetts* 1871, and on *The Red Man and the White Man in North America* 1879. In 1850–54 he was an overseer of Harvard Univ.; 1869 resigned his pastorate; and 1887 became president of the Mass. Historical Soc. His publications, memoirs, histories, sermons, and addresses are very numerous; and he was a frequent contributor to the *Encyclopedia Britannica*, other similar publications, and the religious and secular press. He wrote a number of lives for Sparks's *American Biography*, and several chapters for the *Memorial History of Boston* and the *Narrative and Critical History of America*. He received the degrees D.D. (1857) and LL.D. (1883) from Harvard Univ., being the fourth person who received both from it.

ELLIS, Henry Havelock, English scientist and literary scholar: b. Croydon, Surrey, 1859, Feb. 2. He taught school in New South Wales 1875–9, and on his return to England practised medicine for a short time and then devoted himself to literary and scientific work. He has been general editor of the *Contemporary Science Series* from 1889. He edited the *Mermaid Series of Old Dramatists* (1887–9); and is the author of *The New Spirit* (1890); *The Criminal* (1890, enlarged 1901); *Man and Woman: a Study of Human Secondary Sexual Characters* (1894); *Sexual Inversion* (1897); *Affirmations* (1897); *The Evolution of Modesty* (1899); *The* 19th *Century: a Dialogue in Utopia* (1900); *Analysis of the Sexual Impulse* (1902).

ELLIS, John, English naturalist: b. London about 1710; d. 1776. He was the first who suggested the idea that the South Sea islands were constructed and raised from the bottom of the ocean by means of zoophytes or the polypi inhabiting different species of coral (*Essay Towards a Natural History of Corallines* 1754).

ELLIS, Robinson, English classical scholar: b. Barming, Kent, 1834, Sep. 5. He was educated at Rugby and Balliol College, Oxford; and in 1870 became professor of Latin in Univ. College, London. From 1883 till 1893 he was university reader in Latin literature at Oxford, and in the latter year was elected to the corpus professorship of Latin. In 1867 he published a critical edition of Catullus (*Catulli Veronensis Liber*), in 1871 *The Poems and Fragments of Catullus* in the metres of the original, *Commentary on Catullus* (1876); Ovid's *Ibis*, with commentary (1881); *Fables of Avianus* (1887); *Noctes Manilianæ* (1891); *The Fables of Phædrus* (1894); and a new recension of *Velleius Paterculus*, with commentary.

ELLIS, T. Mullett, English poet and novelist: b. 1850, Dec. 29. He is the founder and editor of *The Thrush*, a magazine for original verse, and has published: *The*

Earl's Nose, humorous verse; *Reveries of World History* (1893); *The Beauty of Boscastle* (1894); *Zalma* (1895); *Tales of the Klondike; God is Love* (1898); *Kitty, a Story of the Transvaal War;* etc.

ELLIS, WILLIAM: 1795–1872: eminent missionary. In 1816, he was sent by the London Missionary Society (Congregational), to the South Sea Islands, where he labored nearly ten years. He set up the first printing-press in Tahiti. In 1824, he returned to England, on account of the illness of his wife. In 1826, he published a *Narrative of a Tour through Owhyhee;* and in 1829, *Polynesian Researches*, 2 vols. In 1839, he published a *History of Madagascar*, 2 vols., compiled from government papers, and information received from missionaries. In 1835, his wife died, and two years afterward he married Miss Sarah Stickney, who is well known as the authoress of many popular works. In 1853, Mr. Ellis was sent to Madagascar by the London Missionary Society. In 1859, he published an interesting and valuable work, entitled *Three Visits to Madagascar, during* 1853–56, *with Notices of the People, Natural History*, etc., a work of great general interest, to which the western world is largely indebted for information concerning that island.

ELLORA, *ĕ-lō′rä*, ELORA, or ELURU, *ĕ-loo′rä*, India: village in the province of Aurungabad; celebrated for some remarkable cave temples, excavated in the solid rock, which in magnitude and perfection surpass all other constructions of the kind in India.

ELLS, ROBERT WHEELOCK, Canadian geologist: b. Cornwallis, N. S., 1845, July 26. He was graduated at McGill Univ. in 1872, and in May of that year joined the staff of the Canadian Geological Survey, of which he later became senior geologist. He is the author of numerous reports on geology and mineral resources, published in the annual volumes of the Canadian Geographical Survey since 1872.

ELLSWORTH, *ĕlz′wėrth*, EPHRAIM ELMER: 1837, Apr. 23—1861, May 24; b. Mechanicsville, N. Y.: soldier. He removed to Chicago at an early age, studied law, became a solicitor of patents, and organized a regt. of zouaves, which as col. he drilled to a remarkable degree of perfection in discipline and milit. tactics. He escorted Pres.-elect Lincoln to Washington 1861, Mar., and at the outbreak of the civil war hastened to New York and raised a zouave regt. exclusively of firemen, of which he was commissioned colonel. His regt. reached Washington in time to extinguish a fire in Willard's hotel that had got beyond the control of local firemen, and then crossed the river and took possession of Alexandria. Noticing a Confederate flag flying over the Marshall House, a hotel owned by a man named Jackson, he went to the roof, tore the flag down, and as he was descending the stairs was shot dead by the

proprietor, who in turn was killed on the spot by Frank Brownell, one of the zouaves who had rushed in after Col. E. The event created intense excitement at the time, as E. was the first officer of his rank killed in the war.

ELLSWORTH, OLIVER, LL.D.: 1745, Apr. 29—1807, Nov. 26; b. Windsor, Conn.: lawyer. He studied at Yale and Princeton Colleges, graduated at Yale, 1766, studied theol. a year, then applied himself to law, and was admitted to the bar 1771. In 1775 he was appointed attor.gen. of Conn.; at the beginning of the revolutionary war was elected a member of the gen. assembly; 1777 was chosen a delegate to the continental congress; served in congress till 1783, June; and was a member of the governor's council 1780–84. He declined the office of commissioner of the treasury 1784, accepted that of judge of the superior court of Conn. the same year, and was a member of the convention that framed the federal constitution 1787. He was elected U. S. senator for the first congress under the new form of govt., was chairman of the committee on the organization of the judiciary, and drafted the bill providing for its creation and defining its functions. After brilliant service as debater, economist, and supporter of Washington's administration, he was appointed chief-justice of the U. S. supreme court 1796, Mar., and served till 1799, when, on the recommendation of the senate, he was appointed with Patrick Henry and William R. Davie an extraordinary commission to negotiate a treaty with France. In this he was eminently successful. Owing to impaired health he resigned the chief justiceship 1800, and spent some time abroad He subsequently became a member of the governor's council; and was appointed chief-justice of the Conn. supreme court, but died without serving. He received the degree LL.D. from Yale College 1790, and from Dartmouth and Princeton 1797.

ELM, n. *ĕlm* [Dut. *olm;* Icel. *almr;* Dan. *alm;* L. *ulmus,* an elm], (*Ulmus*): genus of trees of the nat. ord. *Ulmaceæ,* natives of temperate climates, with serrated leaves unequal in their two sides, and small flowers growing in clusters appearing before the leaves, and containing 4–12 stamens and one germen. The fruit is a samara, or compressed one-seeded little nut, winged all around. ELMY, a *ĕl'mĭ,* abounding in elms.—One of the most important species of Elm is the COMMON SMALL-LEAVED or ENGLISH ELM (*U. campestris*), 60–80 ft. in height, with ovato-elliptic, doubly serrated leaves, and flowers almost destitute of stalks. The wood is compact, and very durable in water. The tree is diffused over Europe; is found also in the w. of Asia and n. of Africa, and is used for a great variety of purposes by wheelwrights, machine-makers, ship and boat builders, etc.; it is also prized by joiners for its fine grain, and the mahogany color which it readily assumes on the application of an acid. It is reckoned superior to the wood of any other species of elm. The bark is used in dyeing, and in sugar-refining, and, in times of scarcity, has been used in Norway for grinding into meal and mixing in bread, which

has a less disagreeable taste than that made from meal mixed with fir-bark. The inner bark is used medicinally in cutaneous diseases; it is mucilaginous, and has a bitter astringent taste. The ELM BALSAM (*Beaume d'orme*), formerly in great repute, is a brownish substance found in dried galls of the leaves in the s of Europe, Persia, etc. From these galls, in an earlier stage, flows a clear, viscid, sweetish liquid, called Elm Water (*Eau d'orme*), used for washing wounds, contusions, and sore eyes.—The seeds of the elm are eagerly eaten by pigeons and common poultry. The elm is one of the principal timber trees and one of chief ornaments of scenery.—The CORK-BARKED ELM (*U. suberosa*), by many regarded as a variety of *U. campestris*, is a European tree, distinguished by the corky wings of the bark of the branches. It is a taller and more spreading tree, with much larger leaves.—The DUTCH CORK-BARKED ELM (*U. major*) also is looked upon by many as a variety of *U. compestris*. It is still more corky in its bark, and has still larger leaves. It is of very quick growth, but the wood is inferior.—The BROAD-LEAVED or WYCH ELM (*U. montana*) is the only species that can with certainty be regarded as indigenous to Scotland. It has rough and broad leaves, a stem less upright than the English elm, and large spreading branches. The wood is used for all the purposes of the English elm. The tree is of very quick growth. Protuberances of gnarled wood are not unfrequently produced, which are finely knotted and richly veined; they are much esteemed for veneering, and are sometimes very valuable. Varieties of this species are known as the GIANT ELM and CHICHESTER ELM.—The SMOOTH-LEAVED ELM (*U. glabra*), by some regarded as a variety of *U. Montana*, is distinguished, besides other characters, by smooth leaves, which are much smaller. It is a native of England. A variety called the HUNTINGDON ELM is much esteemed.—The CORNISH ELM (*U. stricta*), found in the s.w. of England, is remarkable for its rigid, erect, and compact branches.—Very different is the habit of *U. effusa*, a continental species with a large spreading

Common English Elm (*Ulmus Campestris*).

head and smooth bark, distinguished also by the long stalks of its flowers and its ciliated fruit.—The American or White Elm (*U. Americana*), which abounds in New England, the Middle States, and the northern basin of the Mississippi, and attains its loftiest stature between lat. 42° and 46°, is a magnificient tree, sometimes 100 ft. in height, the trunk reaching 60 or 70 ft. before it separates into branches, and the widely diffused pendulous branches floating gracefully in the air; but the timber is not much esteemed.—The Red or Slippery Elm (*U. fulva*), also found in New England and the Western States, and common in the basin of the Mississippi as far south as lat. 31°, and in the w. parts of Canada, attains a height of 50 or 60 ft. The wood is more valuable than that of the last species, but much inferior to the English elm. The leaves and bark yield an abundant mucilage, which is bland and demulcent, and esteemed a valuable remedy in catarrh, dysentery, and other complaints.—The Wahoo or Winged Elm (*U. alata*) is a small tree, found from lat. 37° to Fla., La., and Ark., remarkable for the branches being furnished on two opposite sides with wings of cork. The wood is valuable.—The Corky White Elm (*U. racemosa*), N. England to Wis. and s., has corky ridges and racemed flowers. *U. crassifolia*, of the s.w., has very small, thick leaves.

The name Spanish Elm is given in the W. Indies to a tree also called Bois de Chypre, *Cordia Gerascanthus*, of the nat. ord. *Cordiaceæ*, the timber of which is valuable, also to *Hamelia ventricosa*, of the nat. ord. *Rubiaceæ*, the timber of which is known to cabinet-makers as Prince wood.

Elm-insects. Few ornamental trees are more subject to the attacks of insects than are the elms, and especially the American elm. One of the most notable of these pests is the plant-louse known as *Colopha ulmicola*, which produces the cockscomb galls upon the foliage. It is rarely very troublesome, and has usually done its damage before it can be attacked. Kerosene emulsion, if applied in time, will prove effective. A borer (*Saperda tridentata*) is sometimes troublesome, but there seems to be no satisfactory way to control it. Most of the other insects that attack the elms are beetles, their larvæ, or the caterpillars of various moths. These all bite their food, and hence may be attacked with arsenites or other stomach poisons sprayed upon the foliage. Consult Marlatt, *Elm Leaf Beetle*, Circular 8, Division of Entomology, United States Department of Agriculture.

ELMINA, *ĕl-mē′nâ:* fortified town and seaport of w. Africa, formerly cap. of the Dutch settlements on the Gold Coast; in an undulating and thickly wooded district, lat. 5° 10′ n., and long. about 1° 40′ w. It is large, irregularly built, and destitute of noteworthy architectural features. The inhabitants consist chiefly of traders, fishermen, and artisans. A few miles to the e. is Cape Coast Castle. Elmina was established by the Portuguese 1481.

the first European settlement on the coast of Guinea. It was taken by the Dutch1 637, and, four years later, was ceded to them by Portugal. It was ceded to the British 1872, and destroyed by them 1874, during the Ashantee war. Pop. 6,000.

ELMIRA, *ĕl-mī'ra:* city, cap. of Chemung co., N. Y.; on both sides the Chemung river; on the Erie railroad at the intersection of the Northern Central, and at terminus of the Utica, Ithaca and E. railroad; 46 m. s.w. of Ithaca, 78 m. n. by e. of Williamsport, 149 m. e.s.e. of Buffalo, 274 m. w.n.w. of New York. It is the largest city in that part of the state, is beautifully laid out, has a fine water supply, is lighted by gas and electricity, and beside its river and railroad facilities has a valuable commercial outlet in the Chemung canal, which connects it with Seneca Lake. In 1905 it had over 400 mfg. establishments, using a capital of $8,000,000, employing 5,000 hands, paying in wages over $2,000,000, and yielding products valued at more than $10,000,000. The chief industries are represented by the large shops of the Erie and the Northern Central railroads, rolling mills, blast furnaces, iron foundries, tanneries, flouring mills, breweries, and factories producing boots, shoes, carriages, steel plate, iron and steel bridges, silk, glass, hosiery, furniture, bicycles, steam fire engines, knitted goods, doors, sashes, etc. Next to the iron and coal interest, the wholesale grocery trade is the most extensive, and after that the dry-goods trade. Elmira is the seat of the celebrated N. Y. State Reformatory for men between the ages of 16 and 30 who have not served a period in a state prison, and accommodates about 1,500 inmates annually. Here also is Elmira College, a Presbyterian institution for women, established in 1855. Other notable buildings and institutions are the U. S. govt. building containing the post-office, federal courts, etc., Elmira Free Academy, Elmira Industrial School, the Steele memorial free library, the Arnot-Ogden hospital, many fine public school buildings, handsome churches of numerous denominations, and asylums for orphans and homes for the aged. Among the city parks are Riverside, Eldridge, Wisner and Hoffman; the monuments include one to the Rev. T. K. Beecher, and one to General Sullivan, commemorating the battle of Newtown (prior to 1828, the first name of Elmira), where Aug. 29, 1779, the British forces were defeated. Large mines of the McIntyre Co., which to a great extent furnish the coal supply of the New York Central and Hudson River railroad, are but 20 m. s. of Elmira., and the Blossburg soft-coal field about the same distance s.w. There are several quarries of excellent stone just beyond the city limits. During the civil war Elmira was noted for its great recruiting rendezvous and its military prison, in which a large number of Confederate prisoners were confined. It was incorporated 1865. Pop. (1900) 35,672; (1910) 37,176.

ELMO'S FIRE, *ĕl'mōz*, St : popular name of an ap-

pearance sometimes seen, especially in southern climates during thunder-storms, of a brush or star of light at the tops of masts, spires, or other pointed objects. It is sometimes accompanied by a hissing noise, and is evidently of the same nature as the light caused by electricity streaming off from points connected with an electrical machine: see ELECTRICITY. The phenomenon, as seen at sea, was woven by the Greeks into the myth of Castor and Pollux; and even yet such lights at the mast-head are considered by sailors a sign that they have nothing to fear from the storm.

ELMSHORN, *ĕlms'hŏrn:* town in the Prussian province of Schleswig-Holstein, 20 m. n.w. of Hamburg; on both banks of the Krückau, a navigable stream, and feeder of the Elbe. It is well built, has considerable manufactures and an active trade in grain; it has also a boat-building yard and some tanneries. Vast numbers of boots and shoes are made at E., and sold at all the fairs in the country around. Many Jews reside here, as this was one of the few places in Schleswig or Holstein in which they were allowed to settle without previous permission. E. has an important annual cattle-market. Pop. 10,000.

EL-OBEID: see IL-OBEID.

ELOCUTION, n. *ĕl'ō-kū'shŭn* [L. *elŏcūtĭōnem*, oratorical delivery—from *e*, out of; *lŏcūtus*, spoken: F. *élocution:* It. *elocuzione*]: management and quality of the voice in the utterance or delivery of words; fluency of speech; style or manner of speaking, as distinguished from the wider art of oratory which takes account also of the matter spoken. It was prominent in ancient education, but has been much neglected in modern times: see READING AND SPEAKING. EL'OCU'TIONARY, a. *-ĕr-ĭ*, relating to elocution. EL'OCU'TIONIST, n. *-ĭst*, one versed in, or who treats of, elocution.—SYN. of 'elocution': eloquence; oratory; rhetoric.

ELODEÆ, n. *ĕ-lō'dē a* [Gr. *helōdēs*, marshy, fenny, the habitat of these plants being in such places]: in *bot.*, genus of *Hypercaceæ*, typical of the tribe *Elodeæ*.

ÉLOGE, n. *ā-lōzh'* [F. *éloge*, a eulogy—from L. *elogĭŭm*, a short saying or maxim]: eulogy; panegyric; an oration in honor of a deceased person. When a member of the French *Académie* dies, it is customary for his successor to deliver an oration, setting forth his merits and services. This is called an *éloge*, and a considerable branch of French literature goes by the name. Many of the French éloges are mere florid panegyrics; but others, particularly those written by Thomas, D'Alembert, Bailly, Condorcet, Cuvier, and other eminent savants, are interesting and valuable biographies. The proper epoch of the éloge began with Fontenelle (2 vols. Par. 1731), who was distinguished for clearness, ease, and elegance. His successors have tried to outshine him in pomp of language. ELOGIUM, n. *ĕ-lō'jĭ-ŭm*, or ELOGY, n. *ĕl'ō-jĭ*, a funeral oration—same as *éloge*. EL'OGIST, n. *-jĭst*, one who pronounces an elogy.

ELOHIM, *ĕl-ō′hĭm* [Heb., plural of *Eloăh*, Arab. *Ilâh*, Chald. *Elâh*, Syr. *Alôh*, might, power; in plu., intensified, collective, highest power—great beings, kings, angels, gods, *Deity*]: one of the Hebrew names for God. As a *pluralis excellentiæ* or *majestatis*, and joined to the singular verb, it denotes, with very rare exceptions, *the One*, true God. Joined to the plural verb, however, it usually means gods in general, whether including the One or not. It is mostly used (in the singular sense) for or together with Jehovah (the Everlasting One); but some portions of the Scriptures employ exclusively either the one term or the other. This fact has given rise to endless discussions, and has also suggested among others the notion of different authors of Genesis. On this, and on the relation of those two words to each other, see JEHOVAH: GENESIS: PENTATEUCH. The opinion of the Talmudists, seemingly unnoticed until recently, was that E. denotes the Almighty under the aspect of a God of strict justice; Jehovah, of clemency and mercy. As important for the history of the word E., it is noticeable that it was probably Petrus Lombardus who first tried to prove the Trinity out of this plural form—an attempt which, though unanimously and scornfully rejected by all scholars, from Calvin, Mercerus, Calixtus, the younger Buxtorf, etc., to our times, has lately been revived by Rudolf Stier, who has gone so far as to invent a new grammatical term, '*Pluralis Trinitatis*,' for this purpose. See (besides the titles above) SHEMITIC PLURAL.

ELOHIST, n. *ĕl-ō′hĭst* [Heb. *Elōhim*, a name of God]: the writer, or one of the writers, who is supposed to have introduced the name *Elohim* into certian passages of the O. Test., notably those of the Pentateuch, rather than *Jehovah* as the name for *God;* a Divine name as distinguished from *Jehovah*. ELOHISTIC, a. *ĕl′ō-hĭs′tĭk*, relating to the *Elohim*, as a name of God, said of passages in the O. Test. Scrip.: see ELOHIM.

ELONGATE, v. *ē-lŏng′gāt* [mid. L. *elongātus*, made long—from *e*, out of; *longus*, long]: to extend; to lengthen; to draw out; to go farther off. ELON′GATING, imp. ELON′GATED, pp. ELONGATION, n. *ē′lŏng-gā′shŭn*, the act of lengthening; extension; continuation; departure; apparent distance of a planet from the sun. ANGLE OF ELONGATION, angle measuring the distance between two stars, as seen from the earth; usually employed in speaking of the distance only of planets from the sun; the word 'distance' being used instead of the word elongation, in regard to fixed stars and planets, as related to one another.

ELOPE, v. *ē-lōp′* [Dut. *ontloopen*, to evade, to escape: Icel. *hlaupa;* Dut. *loopen*, to run: Norw. *laupast*, to run away]: to run away privately; to run away from the house of a father, husband, or guardian without leave, in company with another person. ELO′PING, imp. ELOPED′, pp. *-lōpt′*. ELOPE′MENT, n. *-mĕnt*, the private departure from a house without leave, as of a wife from a husband with another man (see ADULTERY), or more usually, as

of a young woman from her parents or guardians in order to be married without their consent.

ELOQUENT, a. *ĕl′ō-kwĕnt* [F. *éloquent*—from L. *eloquentem*, eloquent—from *e*, out of; *loquor*, I speak: It. *eloquente*]: forcible and powerful in the use of appropriate language; fluent; persuasive. EL′OQUENTLY, ad. *-lĭ*. EL′OQUENCE, n. *-kwĕns* [F.]: persuasive speech; the fluent use of forcible and elegant language in public speaking; the power of expressing strong emotions in striking and beautiful language; oratory: see RHETORIC: READING AND SPEAKING.

EL PASO: *ĕl pâ′sō:* city, port of entry, and capital of El Paso co., Tex.; on the Rio Grande river about 1,420 m. from its mouth in the extreme w. of Tex.; on the Atchison, Topeka and Santa Fé, Texas Pacific, and Southern Pacific r.rs. The Mexican Central starts here. Near here is the famous El Paso del Norte (pass of the north) 3,800 feet above the sea, and on the opposite bank of the river the Mexican town of Ciudad Juarez. There are extensive vineyards in the vicinity, and the wine trade is important. E. P. has extensive manufacturing interests, including smelting establishments with oil-burning blast furnaces, meat refrigerating plants, ice factories, gas and electric lighting and power plants, and has a large export and import trade, especially in gold and silver. Pop. (1910) 39,279.

EL′PHINSTONE, WILLIAM: 1430 (or 31)–1514, Oct. 25; famous Scottish prelate, founder of King's College, Aberdeen; son of William E., Canon of Glasgow and Archdeacon of Teviotdale, and, as marriage of ecclesiastics was prohibited, his birth was illegitimate. Elphinstone took his degree M.A. at the University of Glasgow, at the age of 24, at the same time taking priests' orders. From his 29th year he spent 9 years on the continent in the study of law, and gained appointment as prof. in the Univ. of Paris, and afterward at Orleans, then in highest repute as a legal school. Returning to Scotland, he was made successively official-gen. of the diocese of Glasgow (1471–2), rector of the univ. 1474, and official of Lothian 1478, 'then probably the second judicial office in the kingdom.' He was made bp. of Ross 1481; bp. of Aberdeen 1483. Before the death of James III. he was several times engaged in foreign embassies, and was chancellor of the kingdom. Under James IV. he seems to have been keeper of the Privy Seal from 1492 till his death. He was faithful in the care of his diocese, reforming the clergy, the service, and the ritual. It is believed to have been chiefly through his influence that the first printing-press was established in Scotland. He procured (1494) from the pope (Alexander VI.) a bull for erecting a univ. in Aberdeen; and the college, founded 1500, was dedicated to St. Mary—a name afterward changed to King's College. Elphinstone added to his cathedral church at Aberdeen, provided its great bells, and, at his own expense, built a stone bridge over the Dee. The fatal battle of Flodden,

1513, Sep. 9, broke his spirit and he was never afterward seen to smile. He was buried before the high altar of the chapel of the college which he founded. Elphinstone was a man of great vigor of mind and nobleness of nature. His *Breviarium Aberdonense*, printed 1509–10, was reprinted (2 vols. quarto) London, 1853.

ELSBERG, *ĕlz'bėrg*, Louis, physician: b. Prussia, 1836; d. in the United States in 1885. He introduced laryngoscopy in the United States, wrote many papers on the throat and its diseases, notably, *The Throat and the Production of the Voice;* was the first to illustrate the character of undertones and divisions of sound in articulation, and invented many instruments which are used in surgical treatment of the throat and ear.

ELSHOLTZIA, n. *ĕl-shŏlts'ĭ-a* [named after J. S. *Elsholtz*, a Prussian botanist]: in *bot.*, the typical genus of *Elsholtzidæ*, a family of *Lamiaceæ*, tribe *Mentheæ*.

ELSINORE, *ĕl-sĭ-nōr'* (Dan. *Helsingör*): town and seaport of Denmark, on the island of Seeland, on the w. shore of the Sound, and at its narrowest part, 3½ m. w.s.w. of the town of Helsingborg in Sweden, and 24 m. n. of Copenhagen; lat. 56° 2′ n., long. 12° 36′ e. The town, in recent times considerably improved, is spacious, and consists of one long principal street, with several lateral branches. The cathedral, containing some fine tombs, many very old is one of the most interesting edifices. At a short distance e. of Elsinore are the castle and the fortress of Kronborg, the former a white stone building in Gothic style, the latter, a stronghold mounted with guns that command the Sound in all directions. To the n.w. of Elsinore and in its immediate vicinity, is the royal château of Marienlist, the pleasure-grounds of which, occupying the crest of a hill, are open to the public. From the grounds of Marienlist, magnificent views are had of the Sound of Helsingborg, and of the plains of Sweden. The harbor of Elsinore formed by a wooden pier, is accessible to ships of light draught. Elsinore has a brisk foreign trade, and has manufactures of straw-hats, arms, sugar, brandy, etc., also cotton-printing and fisheries. The Sound Dues (q.v.) were collected here. Pop. 14,000.

Saxo Grammaticus, famous writer of the 12th c., was born here. Here Shakespeare laid the scene of his *Hamlet*, a perversion of history on the part of the great dramatist, as Jutland, not Seeland, was Hamlet's country. The vaults under the castle of Kronborg were supposed to be the residence of Holger Danske, the mythic hero of Denmark, who never appeared above ground save when the country was in danger, and was then supposed to march at the head of the Danish armies. In severe winters the Sound is frozen over at Elsinore, so that one can walk over the ice from Denmark to Sweden.

ELSSLER, *ĕls'lėr*, Fanny: 1810, June 23—1884, Nov.; b. Vienna: celebrated dancer. She was educated at Naples

for the ballet, with her eldest sister Theresa. The first success of the sisters was at Berlin, where they appeared 1830. The reputation acquired by Fanny in Berlin preceded her to France, America, England, and St. Petersburg, where her beauty, amiability, and mastery in her art, charmed all classes of society. In 1841, the two sisters went to America, where they excited unwonted enthusiasm. After Fanny had earned laurels in St. Petersburg, she returned, 1851, to Vienna, to take a final leave of the stage. She retired first to Hamburg, and then, 1854, to Vienna, where she died. THERESA ELSSLER (1808–78), was less graceful in her motions than her sister, but exhibited great strength, boldness, and agility. In 1850 she became the wife of Prince Adalbert of Prussia, who died 1873.

ELSTER, *ĕl'stėr*, BLACK: river of Germany, rising in the kingdom of Saxony, within two m. of Elstra. It flows n.w., enters Prussia, and joins the Elbe eight m. s.e., of Wittenberg. Length, 130 miles.

ELSTER, WHITE: river of Germany, rising at the foot of the Elster Mountains, on the n.w. boundary of Bohemia. It flows in a northerly direction, and falls into the Saale three m. s. of the town of Halle, in Prussia. Its chief affluent is the Pleisse from the right. Total length, 165 miles.

ELSTRACKE, REGINALD or RENOLD: English engraver; lived abt. 1620. He worked chiefly for the booksellers and his plates, executed with the graver, without etching, are almost entirely portraits. Prints from his plates are much sought after, not only from their scarcity, and as illustrating English history, but as works of art, in which much character is expressed in a firm and forcible manner. When he did not sign his plates with his name, he marked them with his initials, R. E.

ELTON, *ĕl-tŏn':* famous salt lake of Russia, in the govt. of Saratov, 170 m. s.s.e. from the town of Saratov. The lat. of its centre is 48° 56′ n., and the long. 46° 40′ e. Its longest diameter is 11 m., its shortest about 9 m.: superficial extent of 45,500 English acres. At no place is it more than about 15 inches in depth. It is of oval form, and can be easily reached from the s., but the n banks rise so rapidly that access to it from that quarter is difficult. In the hottest season, so wonderful is the illusion produced by the crystallized salt, that the lake seems covered with snow and ice. Elton yields about 100,000 tons of salt annually, in the collection of which about 10,000 persons are employed.

ELUCIDATE, v. *ĕ-lō'sĭ-dāt* [mid. L. *elucĭdātus*, made clear—from L. *e*, out of; *lucĭdus*, bright, clear: F *élucider*]: to make clear; to throw light upon, to explain. ELU'CIDATING, imp. ELU'CIDATED, pp. ELU'CIDATOR, n. one who. ELU'CIDA'TION, n. *-dā'shŭn* [F.—L.]: the act of throwing light upon anything obscure; illustration; explanation. ELU'CIDATIVE, a. *-tĭv*, or ELU'CIDA'TORY, a. *-tėr-ĭ*, explanatory.

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